

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW OF APPLIED MYCOLOGY

VOL. XV

MAY

1936

FOËX (E.) & BURGEVIN (H.). **Nouvelles observations sur l'action du bore dans la maladie du coeur de la Betterave.** [New observations on the action of boron on heart rot of Beet.]-*C. R. Acad. Agric. Fr.*, xxi, 25, pp. 979-982, 1935.

Continuing their experiments in the control of heart rot of beet in France [*R.A.M.*, xiv, p. 282], the writers again proved the value of boric acid [*ibid.*, xv, p. 189] and sodium borate for this purpose, the former applied at 8 to 10 and the latter at 13 to 16 kg. per hect. for the first treatment and subsequently reduced to an amount to be accurately determined by further trials. [This paper was followed by a discussion (pp. 982-985) by [A.] Demolon and G. Bertrand.]

BRIOUX & JOUIS. **Action du bore sur la maladie de la Betterave.** [The action of boron on the Beetroot disease.]-*C. R. Acad. Agric. Fr.*, xxi, 27, pp. 1039-1042, 1935.

The writers obtained excellent control of heart rot of beet in Seine-Inférieure by the incorporation with the ordinary manure of 10 kg. sodium borate per hect. [see preceding abstract]. The soil in the experimental field was a sandy clay with a P_H of 7.8, almost destitute of boron (0.1 mg. per hect.). The treatment was given some three weeks before sowing on 15th May. Early in September about 75 per cent. of the plants in the untreated portion of the field were diseased, whereas all those receiving boron were in an absolutely sound condition. The weight of 100 treated beets was 87.2 kg. and that of the leaves 66 kg., the corresponding figures for the controls being 55 and 48.3 kg., respectively; the sugar content of the former was 16.96 and of the latter 14.72 per cent. Even more striking results were obtained in a neighbouring field of fodder beets.

It was shown by pot experiments that sodium borate, even at excessively high rates (corresponding to 100 kg. per hect.), did not retard the growth of white mustard, so that apparently no ill effects of the treatment on other crops need be feared.

BRANDENBURG (E.). **Die Brennflecken-Krankheit der Erbsen.** [The anthracnose disease of Peas.]-*NachrBl. dtsh. PflSchDienst*, xv, 11, p. 101, 1 fig., 1935.

As in Holland and the United States anthracnose of peas has been found in Germany to be associated with three fungi, viz., *Ascochyta pisi*, *Mycosphaerella pinodes*, and *A. pinodella* [*R.A.M.*, xii, p. 483; xiv,

p. 613; xv, p. 109], the two first-named being isolated in 1913 from 10 and 7 samples, respectively, of diseased material, while the corresponding figures for 1934 were 9 and 5, respectively; in the latter year one sample also yielded *A. pinodella*, which is readily distinguishable from the others by its smaller spores (average 8.1 by 4.1μ). *A. pisi* and *M. pinodes* differ chiefly in their cultural behaviour, the former producing sparse mycelium and numerous light brown pycnidia with pale orange spore masses, turning the oatmeal substratum straw-yellow in old cultures, while the latter forms an abundance of dark mycelium and pycnidia and does not colour the medium. Perithecia with ripe spores were regularly produced in some of the cultures of *M. pinodes* but not in those of *A. pisi* or *A. pinodella*. In inoculation tests in which healthy peas were soaked for 24 hours in spore emulsions of the three fungi prior to sowing in sterilized soil, *A. pisi* did not attack either the stem base or roots, whereas the two others infected the stem base and *A. pinodella* also caused a certain amount of heavy damage to the roots. Evidently, therefore, the infection of the seed by the two last-named is likely to damage the crop more severely than invasion by *A. pisi*, which does not necessarily involve any loss.

ZAUMEYER (W. J.) & WADE (B. L.). **The relationship of certain legume mosaics to Bean.**—*J. agric. Res.*, li, 8, pp. 715–749, 6 figs., 1935.

In continuation of their studies of the relationship of the viruses of pea, white and alsike clover (*Trifolium repens* and *T. hybridum*), white and yellow sweet clover (*Melilotus alba* and *M. officinalis*), lucerne, red clover (*T. pratense*), and sweet pea mosaic diseases to beans (*Phaseolus vulgaris*) [*R.A.M.*, xii, pp. 414, 741; cf. also xv, p. 134], the authors give details of cross-inoculation experiments, the results of which showed that out of 31 [named] varieties of beans, 30 were susceptible to pea mosaic virus 2. This virus was obtained in 1931 from infected Dwarf Telephone peas in Colorado, and differs from the common pea mosaic mainly in that later in the season it produces on peas a pronounced vein clearing, while immediately adjacent to the larger veins the dark green tissue often persists, and the region between the veins is of a lighter shade than normal; yellow areas are often found, especially along the periphery of the leaves. The leaves and stipules of infected plants are smaller than normal; the plants are only slightly stunted, but the pods may be somewhat malformed and in some cases reduced in size. Pea mosaic virus 1 was not infectious to beans. The white clover mosaic virus caused typical symptoms on 29 of the 31 bean varieties inoculated, while white sweet clover mosaic virus infected 27, and lucerne mosaic virus infected 29 of the 31 varieties. Bean mosaic virus 3 was infectious to 24 out of the 30 varieties tested.

The three bean varieties resistant to the common bean mosaic, namely, Corbett Refugee, Great Northern Idaho No. 1, and Robust, did not react identically when inoculated with the viruses of the other legumes, the first was resistant only to the lucerne mosaic virus, the second was susceptible only to that virus, and the third was susceptible to the viruses of pea mosaic 2, white clover mosaic, and lucerne mosaic. In another series of experiments it was shown that the local lesions produced on beans by tobacco mosaic [*ibid.*, ix, p. 810] and tobacco

ring spot [ibid., viii, p. 139] are different both in symptoms and varietal susceptibility from those produced by the mosaic viruses of white clover and lucerne, and that the various leguminous hosts showed differences in resistance and susceptibility when inoculated with the several legume mosaic viruses.

The thermal death points of the viruses were determined as follows: common bean mosaic, pea mosaic 2, and white sweet clover mosaic viruses, between 56° and 58° C.; white clover virus producing systemic infection of beans, between 58° and 60°; white clover virus causing local lesions on beans and the lucerne virus, between 62° and 65°. The viruses of the common bean mosaic, pea mosaic 2, and white sweet clover mosaic were not infectious at dilutions over 1 in 1,000, while those of the strains of white clover mosaic and of the lucerne mosaic were still infectious at a dilution of 1 in 2,000. *In vitro* the viruses of the common bean mosaic and white sweet clover mosaic lost their infectivity in 28 to 32 hours, that of pea mosaic 2 in 24 to 28 hours, that of the white clover mosaic producing local lesions on beans in 28 to 32 hours, and that of the strain causing systemic lesions in 32 to 48 hours; the lucerne virus was inactivated in 3 to 4 days. The viruses differed somewhat in their resistance to the action of hydrochloric acid, alcohol, and formaldehyde.

Field researches would indicate that the pea mosaic virus 2 is not as widespread as the common pea mosaic, and that lucerne mosaic is also limited in its dissemination; the mosaic diseases of white clover and white sweet clover, on the other hand, have been found in many localities, and it is assumed that they occur wherever the hosts are grown. Until bean varieties [cf. ibid., xv, p. 134] resistant to these diseases have been developed the crop should be grown as far as possible from clover fields, and all leguminous weeds growing in close proximity to beans should be removed and destroyed.

BÖNING (K.). **Die Blattfleckenkrankheit des Selleries.** [The leaf spot disease of Celery.]—*Obst- u. Gemüseab.*, lxxxi, 10, pp. 155–156, 1935.

In this account of celery leaf spot [*Septoria apii*: *R.A.M.*, xiii, p. 614] in Germany control measures recommended include the disinfection of fresh seed with one of the officially recognized preparations or the use of seed three to four years old, and regular treatment of the plants, from the seedling stage onwards, with a 1 to 2 per cent. copper-containing fungicide. It is also stated that liberal applications of potash to the soil considerably reduce the losses from leaf spot, while temporary benefit may also accrue from a top dressing with soluble nitrogen, which should be followed by other fertilizers. The delicate, so-called 'market' varieties of celery are the most susceptible to leaf spot.

NEERGAARD (P.). **Selleriskurv, fremkaldt af *Alternaria radicina*.** [Celery scab induced by *Alternaria radicina*.]—Reprinted from *Beretn. Nord. Jordbr Forskn. Kongr.* 1935, 7 pp., 1935.

In the spring of 1934 Prof. C. A. Jørgensen examined some celery

roots presenting the typical symptoms of scab (*Phoma apiicola*) in the form of a dry, brown, cracked crust a few millimetres in thickness, with which was interwoven a mycelium resembling that of *P. apiicola* in structure. Repeated isolations, however, uniformly yielded *Alternaria radicina*, hitherto known only as a parasite of carrots [*R.A.M.*, xiii, p. 740]. There was found to be no appreciable difference in susceptibility to infection through the soil by *A. radicina* between the Alabaster, Non Plus Ultra, and Amager Market varieties. The effects of inoculation of seedlings recalled the symptoms of damping-off and included a brown or black discoloration of the root and hypocotyl, accompanied in severe cases by a shrivelling of the tissues which eventually led to the collapse of the seedling; recovery was occasionally observed, however, in milder attacks involving only partial necrosis of the root system. *A. radicina* was re-isolated from some of the infected plants and used with positive results in a fresh series of inoculation tests. Although the environmental conditions in these trials were particularly conducive to infection, it seems not unlikely that *A. radicina* may attack celery seedlings in nature, more especially as Miss Doyer has shown it to be capable of causing a similar disease on carrots in Holland [*ibid.*, xii, p. 72].

Of 31 one- and two-year-old Alabaster plants inoculated on the roots with the mycelium and spores of *A. radicina*, 28 contracted infection, while all the 22 controls remained healthy. *A. radicina* was re-isolated from some of the diseased roots. In 25 of the inoculated plants the fungus invaded all the aerial organs, causing a brown discoloration, shrivelling, and collapse of the tissues; the 6 that showed no symptoms on the foliage were inoculated out of doors at an extremely high temperature (maximum 43° in the sun), the upper limit for the growth of the pathogen, according to American observations, being about 39° [*ibid.*, vi, p. 269]. *A. radicina* was re-isolated from the diseased leaves and inoculated with positive results into 14 plants.

Presumably in the field, where the fungus is capable of leading a saprophytic existence, young celery plants, like carrots, become infected through the petiole bases, whence the decay passes downwards to the root. The inflorescences of two-year-old plants may be destroyed and the seed infected, while the progeny of the latter may either be rapidly killed by the fungus or survive to harbour the pathogen and so aid in its continued spread.

TAUBENHAUS (J. J.). **Seeds of Watermelons and Okra as possible carriers of Fusarium wilt.**—Abs. in *Phytopathology*, xxv, 10, p. 969, 1935.

Fusarium [*bulbigenum* var.] *niveum* was recovered from all parts of the roots, stems, peduncles, rind, and a very small percentage of the interior of the seed of infected watermelon fruits [*R.A.M.*, xv, p. 256]. Similarly, *F. vasinfectum* was isolated from all parts of the roots, stems, pod tissue, and a very small proportion of the interior of the seed of okra [*Hibiscus esculentus*: *ibid.*, ix, p. 378; xi, p. 183]. Evidently, therefore, the seeds of either infected watermelons or okra may act as internal carriers of *Fusarium* wilt.

TUCKER (C. M.). *Diaporthe phaseolorum* on Pepper fruit.—*Mycologia*, xxvii, 6, pp. 580–585, 2 pl., 1935.

A brief account is given of a rot of ripe and green chilli (*Capsicum annum*) fruits which was observed in 1932 and 1933 in Columbia, Missouri, in the form of black, leathery, long, and narrow lesions, the dead tissue in which eventually becomes dry and bleached. The affected areas bear minute, subglobose, erumpent pycnidia, usually 200 to 300 μ in diameter, containing α and β spores characteristic of *Phomopsis*, a genus apparently not recorded hitherto on chilli in America. The former spores are continuous, ovoid to oblong-fusoid, hyaline, and measure 7.2 to 9.2 by 2.2 to 3.2 μ (average 7.9 by 2.7 μ); they develop first and germinate readily, while the latter develop later and rarely germinate. In pure culture the fungus grew well on all ordinary agar media; on potato dextrose agar it produced pycnidia, much larger than in nature, in about ten days; the young pycnidia contain both α and β spores, averaging 6.1 by 2.6 μ and 14.6 by 1.5 μ , respectively. In one-month-old cultures perithecia were found 150 to 300 μ in diameter, with a long, sinuous, irregular, carbonaceous, and ostiolate beak, usually in clusters, immersed in black, carbonaceous stromata; the asci are clavate, 34.2 to 44.1 by 7.2 to 9 μ , and contain eight obliquely monostichous, fusoid-ellipsoid, bicellular ascospores, constricted at the septum, and 9 to 11 by 2.5 to 3.5 μ (average 9.9 by 3.1 μ). Under laboratory conditions, inoculation of the fungus into detached, wounded chilli fruits caused a soft, wet rot spreading over the whole fruit.

Single ascospore cultures reproduced both the pycnidial and ascomogenous stages, establishing the genetic connexion of the two forms, and proving the homothallic character of the fungus. The sexual stage was identified by Wehmeyer, to whom a culture was submitted, as belonging to the group recently described by him as *Diaporthe phaseolorum* [*R.A.M.*, xiii, p. 270]; the names *Phoma capsici* Magnaghi [*ibid.*, ix, p. 227], *P. capsici* f. *caulicola* Bianchi (*Atti Ist. bot. Univ. Pavia*, ii, 9, p. 291, 1911), and *Phomopsis capsici* (Magnaghi) Sacc., all probably refer to the *Phomopsis* stage of the fungus.

STOREY (H. H.). Virus diseases of East African plants : III.—Rosette disease of Groundnuts.—*E. Afr. agric. J.*, i, 3, pp. 206–211, 2 figs., 1935.

A full, popular account is given of groundnut rosette, with particular reference to Tanganyika conditions [*R.A.M.*, xiii, p. 747], the chief points dealt with including the effects on the plant of the typical form of the disease as well as of the three forms differentiated in Sierra Leone [*ibid.*, xiv, p. 739], transmission by *Aphis laburni*, range of plants affected and varietal resistance, methods of diagnosis, and control by destruction of self-sown plants in the off-season, the adoption of a uniform sowing date throughout a district, and close spacing.

HIGGINS (B. B.). Breeding Peanuts for disease resistance.—Abs. in *Phytopathology*, xxv, 10, pp. 971–972, 1935.

Since 1931 the writer has been breeding groundnuts with a view to

obtaining disease-resistant varieties better adapted to Georgia conditions than those now grown. A preliminary study of the data on some 200 crosses, including combinations between 15 varieties, indicates that in most of the characters under consideration the F_1 plants are intermediate between the parents, while in the second generation they segregate in approximate Mendelian ratios. Resistance to the two leaf spots, *Cercospora personata* and *C. arachidis* [R.A.M., xiv, p. 82], appears to be inherited independently, selections very resistant to one often being highly susceptible to the other. Some hybrid strains are very susceptible and others highly resistant to *Sclerotium rolfsii* [ibid., xiv, p. 212].

PACCA (D. W.). **Sobre o 'Diplodia' da Manioca.** [On the Cassava 'Diplodia'.]—*Rodriguésia*, i, 2, pp. 77–82, 5 pl., 1935.

In June, 1933, the author examined mummified cassava roots from two localities in Brazil, the cortex of which was wrinkled and bore sub-globose pycnidia containing hyaline or dark, septate, longitudinally striated spores, measuring 24 to 30 by 12 to 18 μ , mixed with filiform paraphyses thickened at the apex. Other cassava roots showed the pycnidia of the same fungus completely immersed in the cortex, the spores being emitted in a long, gelatinous, hyaline, later black, cirrhous. Pycnidia identical with those seen in nature were developed in culture and the fungus is referred to *Diplodia* (*Botryodiplodia*) *theobromae*; *B. manihotis* Sydow is stated to differ from it chiefly in the absence of paraphyses.

Inoculations with pure cultures of the fungus on wounded and unwounded surfaces of fully grown cassava (*Manihot palmata* var. *aipi*) roots, incubated in a damp chamber at laboratory temperature, all gave positive results, but other experiments were negative, and the author considers that *B. theobromae* is a weak parasite attacking only wounded or sickly cassava roots. The disease may, however, become serious in storage, where most of the spoilage in cassava was ascertained to be due to it. Cacao fruits were successfully infected by the fungus with the production of characteristic symptoms, and on re-isolation it was inoculated into other cacao fruits and also into cassava roots again with positive results.

It is stated in an appendix that a cassava root disease 'saporema' which affected 40 per cent. of the plants in one locality was associated with *B. theobromae* and a fungus with rhizomorphs resembling a *Rosellinia*; from data supplied by other Brazilian workers the author considers that *Armillaria mellea* may also be associated with the condition.

UPPAL (B. N.) & KULKARNI (N. T.). **Fusarium wilt in Sann Hemp.**—*Curr. Sci.*, iv, 5, pp. 314–315, 1935.

In this preliminary note the authors state that cross-inoculation experiments in soil temperature tanks at 28° C. demonstrated that cultures of *Fusarium vasinfectum* from sann hemp (*Crotalaria juncea*) did not infect pigeon pea [*Cajanus cajan*] and vice versa, though the control plants in all cases showed a high percentage of deaths; these results do not confirm those reported by Mitra, working on the same lines [R.A.M., xiv, p. 144].

OLTARJEVSKI (N. P.). К вопросу об изучении некоторых экологических факторов в развитии милдью Винограда.—[A note on the study of certain ecological factors in the development of Vine mildew.]—*Советск. Бот.* [*Sovetsk. Bot.*], 1935, 4, pp. 77–80, 1935.

A few details are given of laboratory experiments, the results of which showed that when vine leaves exhibiting oily patches, but still devoid of vine mildew (*Plasmopara viticola*) conidia, were collected just after sunrise and kept in the dark, they developed the conidial efflorescence within seven or eight hours (about 2 or 3 p.m.), while similar leaves kept in daylight but out of direct sunlight, produced the efflorescence about twelve hours later (2 or 3 a.m.). In another series of experiments it was shown that the production of the conidia was proportionately delayed by gradually increasing the intensity of the light to which the leaves were exposed. There also was evidence that oily spots of longer standing required a longer exposure to darkness, occasionally reaching ten or eleven hours, than newly formed patches to produce the conidia.

Records in the Caucasus, where the climate is of the continental type, show that visible outbreaks of vine mildew may follow nights with a temperature minimum between 13° and 10° C. [*R.A.M.*, xiv, pp. 9, 421], provided this minimum occurs just before sunrise.

GARBOWSKI (L.). **Choroby roślin użytkowych w okresie 1931–1933 r. Zestawienie notowań Zakładów Ochrony Roślin.** [Diseases of useful plants in the period 1931–1933. A summary of the observations of the Plant Protection Stations.]—*Roczn. Ochr. Rośl., Cz. A* (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for period 1931–1933 incl.], Bydgoszcz, pp. 406–580, 1935.

This is a complete list, arranged under the hosts, of records of fungal, bacterial, virus, and physiological diseases of field crops, useful and ornamental plants, and forest trees which were made by the various Plant Protection Stations of Poland [see below, p. 306] during the period from 1931 to 1933, inclusive, the locality and date of the record being cited in each case. A few notes are also given on varietal differences in resistance of some of the more important crops, such as potatoes, wheat, barley, and the like, to certain of the diseases.

Sprawozdania z działalności Zakładów Ochrony Roślin. [Reports on the activities of the Plant Protection Stations.]—*Roczn. Ochr. Rośl., Cz. A* (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for period 1931–1933 incl.], Bydgoszcz, pp. 9–235, 1935.

This paper consists of the reports of the Polish regional plant protection stations and their sub-stations, each signed by the Director or responsible officer, of their administrative, scientific, and practical activities from 1931 to 1933, inclusive, in the control of the diseases and pests of the chief cultivated crops, ornamental plants, and forest trees in Poland. Most important was the work of controlling potato

wart disease (*Synchytrium endobioticum*), especially in small holdings and in gardens in industrial centres. The task is stated to have been greatly handicapped by the difficulty of inducing the poorer population to grow the wart-resistant potato varieties recommended by the authorities. The only effective measure to enforce the adoption of such varieties is to compel the growers of wart-susceptible potatoes to dig them up and to destroy them *in loco* under administrative supervision, without the payment of any monetary compensation.

A heavy outbreak in 1932 of cereal rusts, especially of wheat black rust (*Puccinia graminis*) induced many of the stations to resume their campaign for the elimination of barberries from their territories. Cereal smuts (chiefly *Tilletia caries*, *Ustilago avenae*, and *Urocystis occulta*) were also rather prevalent in certain regions, and this led to the testing by the stations of numerous old and new methods of seed-grain disinfection [see below, p. 284].

SU (U. T.). India : new diseases of crops during the year 1934-1935 in Burma.—*Int. Bull. Pl. Prot.*, ix, 12, p. 273, 1935.

The following diseases with six others were newly recorded during the period under review: *Cercospora henningsii* on cassava [*R.A.M.*, xv, p. 59]; *Choanephora cucurbitarum* on chilli [*ibid.*, xi, p. 803]; and *Macrosporium parasiticum* [*Pleospora herbarum*] on *Allium* sp. [*ibid.*, xiii, p. 614].

NOBLE (R. J.). Australia : notes on plant diseases recorded in New South Wales for the year ending 30th June 1935.—*Int. Bull. Pl. Prot.*, ix, 12, pp. 270-273, 1935.

During the period under review oats in New South Wales were attacked by *Bacterium striafaciens* and rye by *Bact. translucens secalis* [*R.A.M.*, xi, p. 434]. Maize suffered from poor germination and seedling blight following infection by *Gibberella moniliformis* and *G. fujikuroi* var. *subglutinans* [*ibid.*, xv, p. 12], the former being also mainly responsible for cob and grain rot, though *Diplodia zeae* was more prevalent in the cooler tableland areas. Sorghum was seriously affected by *Colletotrichum graminicolum* [*ibid.*, xiv, pp. 286, 494, 575] and *Bact. (?) holcicola* [*ibid.*, xiv, p. 562].

Pears were recorded for the first time as the host of a powdery mildew (*Podosphaera* sp.). Unusually heavy losses were caused by brown rot (*Phytophthora hibernalis*) [*ibid.*, xiv, p. 315] of citrus, while the root rots due to *Armillaria mellea* [*ibid.*, xi, p. 40] and *Ganoderma* sp. were of considerable local importance. During the autumn and winter leaf yellowing, associated with magnesium deficiency, also attracted attention. *Fomes pomaceus* [*ibid.*, xiv, p. 375] was observed for the first time on peaches.

The wilt stage of bacterial tomato canker (*Aplanobacter michiganense* [*ibid.*, xiv, p. 348] was detected for the first time in field crops, and another new record for the Colony was *Fusarium orthoceras* var. *pisi* on peas [*ibid.*, xiv, p. 613]. The tomato spotted wilt virus occurred on dahlias [*ibid.*, xiv, p. 201] and *Schizanthus* [*ibid.*, xiv, p. 662].

SIMMONDS (J. H.). *The work of the Pathological Branch.—Rep. Dep. Agric. Qd.* 1934–1935, pp. 72–74, 1935.

This report contains the following items of phytopathological interest apart from those already noticed from other sources [cf. *R.A.M.*, xiv, p. 216]. In a spraying experiment against blue mould of tobacco (*Peronospora hyoscyami*) [*P. tabacina*: *ibid.*, xv, p. 121] the best control was obtained by colloidal copper (1 in 30) plus 0.5 per cent. potash soap as a spreader. Both colloidal copper and copper emulsion gave encouraging results in the field. The large leaf spot of bananas caused by *Cordana* [*Scolecotrichum*] *musae* [*ibid.*, xiv, p. 45], formerly rarely found in southern Queensland, occurred with greatly increased intensity. A black tip disease of green banana fruits was associated with a fungus apparently identical with *Helminthosporium torulosum* [*ibid.*, xiv, p. 323]; the condition has hitherto been rather infrequent in Queensland. The evidence obtained as to the relative importance of the organisms associated with banana black end largely confirmed Miss Hoette's findings for the Melbourne markets [*ibid.*, xv, p. 104] in showing that the greater part of the loss caused is due to *Gloeosporium musarum*.

Home-made colloidal copper (1 in 13) gave promising results in the control of brown spot on Emperor mandarin oranges [*Phoma citricarpa*: *ibid.*, xiv, p. 216] and is considered likely to prove a useful substitute for Bordeaux mixture on citrus as it also resulted in much less scale insect infestation than when Bordeaux mixture was used.

Pineapple black heart [loc. cit.] was prevented by enclosing the fruit in paper bags, but the amount of labour necessary rendered the commercial application of this procedure impossible.

Sulphur and copper sprays and a sulphur-copper sulphate dust all effectively controlled papaw powdery mildew, caused by a species of *Sphaerotheca* [loc. cit.], though Bordeaux mixture and colloidal copper produced severe scorching of the young leaves even when used at reduced strengths.

A *Rhizoctonia* caused considerable loss from root rot to hoop pine (*Araucaria cunninghamii*) nursery stock in the Brisbane Valley area. In field tests spraying with lignasan [*ibid.*, xiv, p. 729] gave promising results against blue stain of *A. cunninghamii*, but it is doubtful whether spraying will prove economically practicable under Queensland conditions.

Botany. *Ex Work of the Agricultural Experiment Station. Report of the Director for the year ending June 30, 1934.—Bull. Mo. agric. Exp. Sta.* 358, pp. 37–41, 1935.

The following investigations were conducted by C. M. Tucker (in collaboration with C. G. Schmitt in the damping-off tests). Experiments are in progress in the development of rhubarb varieties resistant to foot or crown rot (*Phytophthora parasitica*) [*R.A.M.*, xiii, p. 14], which is so virulent in the State as to limit home production.

Bacterium pruni [*ibid.*, xiv, p. 220; xv, p. 235] was isolated from the gum-filled cavities formed in the hypertrophied woody tissues of cankers on budded sweet cherry trees, the cambium and cortex of which were destroyed while a wedge-shaped mass of dead xylem extended

to the pith. The young trunks were attacked at any point between the bud union and a height of some 18 in. and from one to a dozen cankers were observed. The Black Tartarian, Bing, and Schmidt's Big varieties were more susceptible than Lambert. Inoculation experiments with *Bact. pruni* on Bing gave positive results without, however, affording proof as to the capacity of the organism to produce cankers under natural conditions.

A severe canker of Starking, Stayman, Winesap, and Golden Grimes apples was associated with a *Phoma*-like fungus, the action of which, however, is believed to be only secondary. The cankers were either scurfy or circular and well-defined, of the target type. Badly affected branches died back from the tips and small islands or streaks of brown, necrotic tissue appeared in the cortex.

The best control of loose smut of Spartan barley [*Ustilago nuda*] was obtained by prolonged immersion of the seed-grain in water at 45° to 48° C.

Good control of damping-off (*Pythium de Baryanum*) in Bonny Best tomatoes was given by seed treatment with 1 gm. Du Bay 738 or 0.5 gm. new improved ceresan [ibid., xiv, p. 146; xv, p. 10]. Ethyl mercury phosphate (a constituent of both the foregoing) was tested on 1,500 seeds each of a number of garden plants to determine its effect on damping-off. It increased the number of plants and caused no injury to various crucifers, spinach, and asparagus at the rate of 2 gm. per 5 in. pot of soil, but at 1 gm. it markedly retarded germination and caused some stunting in pepper [*Capsicum annuum*], eggplant, beet, and tobacco, while at 2 gm. cucumber, celery, lettuce, and beans [*Phaseolus vulgaris*] were similarly injured.

Division of Botany.—*Rep. N.Y. St. agric. Exp. Sta., 1934-1935*, pp. 30-36, 1935.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiv, p. 218], contains among others the following items of phytopathological interest. Under western New York conditions the newly introduced Potomac variety of purple raspberry [*Rubus neglectus*] escapes green mottle mosaic (formerly called red raspberry mosaic) [loc. cit.] exceptionally well for a purple variety, but has not been adopted by growers because its fruit is inferior in quality to Columbian. Stock of the recently named and introduced Sodus purple raspberry is mosaic-free, and it is hoped that its present promise will be maintained and that it will rapidly replace Columbian.

The so-called strawberry mosaic [cf. ibid., xii, p. 204], 'June yellows', is increasing every year in stock of the standard Premier variety in the Chautauqua and Erie counties of New York, the Chesapeake and Marcus varieties being affected for the first time in 1935.

Stewart's wilt disease of maize [*Aplanobacter stewarti*: ibid., xv, p. 211] was absent in 1934, after being epidemic during the years 1931 to 1933. Owing to drought tomato blossom-end rot was very serious.

During the period under review approximately 20,000 bushels of Surprise pea seed were treated with red [cuprous] copper oxide [ibid., xiv, p. 673] to prevent decay, and on an average between 20 and 30 per cent. of the seeds were saved. Tests with the substance as a spray

and dust fungicide showed it to be highly efficient [ibid., xiv, p. 382]. Used as a spray against hop downy mildew [*Pseudoperonospora humuli*: ibid., xiv, p. 191], which appeared in New York in epidemic proportions, it did not stunt the cones, as Bordeaux mixture did, though both sprays checked the disease satisfactorily.

The treatment of potato seed tubers with yellow oxide of mercury (1 lb. per 15 galls. of water) again markedly delayed emergence but increased the yield of Irish Cobbler considerably, and of Green Mountain very slightly. When calomel [mercurous chloride] or yellow oxide of mercury was mixed with a fertilizer at the rate of 2, 4, and 6 lb. per ton and applied to potatoes against scab [*Actinomyces scabies*: ibid., xiv, p. 150], the percentage of clean tubers was much higher on the plots treated with the two larger amounts than on the untreated controls; there seemed to be little difference in the fungicidal value of the two materials.

Winter vetch [*Vicia villosa*] is frequently attacked in New York by *Ascochyta pisi viciae*, introduced into the field by the sowing of infected seed. Seed from the southern States often showed 15 to 20 per cent. infection, while that from a few European countries was clean, though the seed from other exporting areas carried 5 to 20 per cent. infection.

VAN HOOK (J. M.). **Indiana fungi, XIII.**—*Proc. Ind. Acad. Sci.*, xlv (1934), pp. 55-64, 1935.

The following are among the many records of interest in this list [*R.A.M.*, x, p. 84]. *Phyllosticta fallax* Sacc. & Roum., characterized by pycnidia 50 to 100 μ in diameter, and chlorine- to dark-coloured spores 3 by 5 μ , was detected on *Acer saccharinum* leaves, this being apparently the first record of the fungus in the United States. Violets were attacked by *Septoria violae* var. *rostrata* n.var., characterized by filiform, straight or curved spores, 20 to 30 by 1 to 1.3 μ , with conspicuously dark beaks; the spots formed by the fungus measure 0.5 to 3 mm. in diameter and are circular, pallid to brownish-yellow, with a reddish-brown border. *Trichothecium roseum* [ibid., xiv, p. 569] occurred in a destructive form on fern (*Pteris longifolia*) prothallia, causing damping-off. Parsnips were attacked by *Cercospora pastinacae*. *Valsa* (*Cytospora*) *leucostoma* was found on peach [cf. ibid., xv, pp. 15, 162] and *Prunus* sp. in a parasitic form. In 1915 an entire lot of *Cosmos* was killed by *Phomopsis stewartii* [ibid., xv, p. 100] (diagnosed at the time as a *Phlyctaena*).

ROGER (L.). **Notes de pathologie végétale.** [Notes on plant pathology.] —*Agron. colon.*, xxiv, 215, pp. 139-147, 1935.

Brief popular notes are given on the following fungal diseases found on material received from French possessions overseas: *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, xiv, p. 653] occurred on leaves and grain of *Oryza montana* from Togo, and *Rosellinia* (?) *necatrix* [ibid., x, pp. 659, 775; xiv, p. 176], provisionally identified from mycelium and rhizomorphs only, caused in Bangui a root and collar rot of coffee, with defoliation in two or three weeks, followed by die-back. *Colletotrichum coffeanum* [ibid., xiii, pp. 114, 367; xiv, p. 32] was responsible for a die-back of coffee in French Guinea, the losses in one

locality being estimated at over 50 per cent. The 'cherries' on the affected branches were small and became severely infected by *Cercospora coffeicola*.

H. torulosum [see above, p. 281] was found in French Guinea on bananas blackened at the tip. The disease is stated to be most prevalent in wet, hot seasons and old, over-thick or badly drained plantations. *C. personata* [ibid., xiii, p. 747; xiv, p. 212] occurred on ground-nuts from Togo. The young plants had been imported from Nigeria, and the attack began as soon as germination started; no crop was obtained, and all the plants had to be destroyed. It is stated that while the fungus rarely fructifies in the dry climate of Senegal it does so frequently in the more humid regions of French West Africa.

HART (HELEN) & ZALESKI (K.). **The effect of light intensity and temperature on infection of Hope Wheat by *Puccinia graminis tritici*.**—*Phytopathology*, xxv, 12, pp. 1041–1066, 6 figs., 1935.

Under the normal conditions of intense sunlight prevailing in the Upper Mississippi Valley, Hope wheat plants at various phases of development beyond the seedling stage appear to possess a fair degree of resistance to *Puccinia graminis tritici* 21 [*R.A.M.*, xiv, p. 747], but when the intensity of the light is reduced by shading the plants, they become as completely susceptible to the rust as they are in the seedling stage. High temperatures (29° to 33° C.) were found to confer the same apparent resistance to *P. graminis tritici* 21 as intense sunlight. Such pustules as were formed were minute, no spores developed, and hypersensitive flecks, pigmentation, and chlorosis were abundant. These data would seem to support the view that environmental factors influence the host-parasite complex as a whole rather than its component parts [ibid., xi, p. 628].

LESZCZENKO (P.). **Zestawienie wyników doświadczeń nad skutecznością środków grzybobójczych wykonanych w Polsce w latach 1918–1933.** [A summarized report of the results of efficacy tests of fungicides, which were carried out in Poland in the period 1918–1933.]—*Roczn. Ochr. Rośl., Cz. A (Choroby roślin)*, ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for the period 1931–1933 incl.], Bydgoszcz, pp. 236–394, 1935.

In a brief introductory note the author states that the tables which form the bulk of this paper (pp. 246–387) embody the summarized results of all but a few of the tests which have been carried out in Poland from 1918 to 1933 to determine the relative fungicidal efficacy of some 70 chemical substances and proprietary preparations already in common use or newly recommended for the control of fungal diseases of various cultivated field and ornamental plants. For each disease are listed the fungicides tested, the locality, author, and year of the test, the concentration used, the method of application, the result, in percentages, of the treatment, and the host varieties included in the test, together with incidental notes. For annual crops, the effects of the fungicides on germination of healthy seeds are also tabulated.

Steeping smutted cereal seed-grain for 15 to 30 minutes in 0.1 to 0.15 per cent. formaldehyde solution gave complete control of wheat

bunt (*Tilletia tritici*) [*T. caries*], stripe smut of rye (*Urocystis occulta*), loose smut of oats (*Ustilago avenae*), and smut (*U. panici-miliacei*) [*R.A.M.*, xiii, p. 749] of millet [*Panicum miliaceum*]. This treatment applied to smut-free seed-grain usually resulted, especially with wheat, in increased yields. Almost equally good control of the smuts was afforded by steeping the seed-grain for 15 to 30 minutes in a 0.25 to 0.5 solution of a proprietary mixture of cupric and cuprous sulphites manufactured by Mg. Klawe under the name 'granosan' [cf *ibid.*, xiv, p. 809]; in laboratory tests, however, this preparation appeared to depress somewhat the germination and early growth of wheat, this effect being obliterated later in the season. Among organic mercury compounds, excellent control of wheat bunt, loose smut of oats, and stripe smut of rye was afforded by steeping the grain in 0.5 per cent. uspulun or 0.125 to 0.25 per cent. germisan for one hour. Both substances in the laboratory significantly stimulated the germination of the cereals, and in the field tests markedly increased their yield in grain. Highly satisfactory control of the cereal smuts was obtained by the local dusts 'ziarnik' [abavit B] and No. 413 [see next abstract] of the 'Azot' Works, both preparations stimulating germination and increasing the yield. Of foreign dusts, good control of the smuts was given by uspulun and germisan dusts, at doses of 0.25 to 0.5 per cent. and 0.25 to 0.3 per cent., respectively. American copper carbonate dust did not control the smuts commercially.

Considerable reduction in the severity of primary outbreaks of *Cercospora beticola* [*ibid.*, xv, p. 193] on sugar beets was obtained by steeping infected seed-clusters in 0.1 to 0.2 per cent. formaldehyde solution for 15 to 30 minutes, or in 0.5 per cent. uspulun, 0.25 per cent. germisan, 0.5 per cent. tillantin, or 0.25 to 1 per cent. annogen-annogran for 1 hour.

ZALESKI (K.) & DORYWALSKI (J.). Dwuletnie doświadczenia polowe z zaprawianie nad zwalczaniem śnieci cuchnącej u Pszenicy ozimej Edel-Epp (z lat 1932/33 i 1933/34.) [Two years' field experiments in the control of bunt in Edel-Epp winter Wheat (in 1932-1933 and 1933-1934.)]—*Roczn. Nauk rol., Poznań*, xxxv, 3, pp. 444-455, 1935. [English summary.]

The results [which are discussed and the statistical data tabulated] of two years' experiments under exceptionally favourable conditions in the control of bunt (*Tilletia tritici*) [*T. caries*] in Edel-Epp winter wheat at the Faculty of Agriculture and Forestry, Posen University [*R.A.M.*, vii, p. 624], showed the best of the treatments tested to be abavit B (known in Poland as 'ziarnik') [see preceding abstract] and germisan dusts (200 and 300 gm. per 100 kg. seed-grain, respectively), and immersion for 15 minutes in 0.25 per cent. formaldehyde or for 5 minutes in 1 per cent. copper sulphate followed by 5 to 10 minutes in 1.5 per cent. milk of lime. In one year's trials both Polish and American brands of copper carbonate (200 and 285 gm. per 100 kg., respectively), Polish and German uspulun (200 and 350 gm. per 100 kg., respectively), and a new Polish dust known as '413 a' [see preceding abstract] proved efficacious, while satisfactory control was also given by 30 minutes' immersion in 0.25 per cent. German uspulun, 15 minutes

in 1.3 per cent. Bordeaux mixture, the same in germisan (60 gm. in 3 l. water per 100 kg.), and sprinkling with 0.25 per cent. formaldehyde in 10 l. water per 100 kg. The choice of any one of these treatments should depend on economic considerations, which will naturally vary according to local agricultural conditions.

MUNCIE (J. H.) & FRUTCHEY (C. W.). Field trials on control of Wheat stinking smut by dust fungicides.—*Quart. Bull. Mich. agric. Exp. Sta.*, xvii, 4, pp. 189–192, 1935.

A tabulated account is given of the results of three years' tests on the comparative efficacy of a number of dry and liquid preparations in the control of wheat bunt (*Tilletia levis*) [*T. foetens*] in the Red Rock and American Banner varieties, from which it appears that the most satisfactory were sanoseed [*R.A.M.*, xiv, p. 118], containing 5 per cent. ethanol mercury chloride, Heyden dust (3.4 per cent. mercury + 30 per cent. copper carbonate), Paris green (25 per cent. copper carbonate + 60 per cent. arsenic trioxide), and Du Bay 655 [*ibid.*, xi, p. 634] (2 per cent. ethyl mercury), reducing the incidence of infection from 37.8 to 0.21, 0.30, 0.43, and 0.43 per cent., respectively. The next most effective were 50 per cent. copper carbonate, Du Bay 986 (2 per cent. ethyl mercury phosphate), and saatbeize P. 237 (15 per cent. mercury + arsenic + copper carbonate), while a number of other treatments, including 2 per cent. ethanol mercury iodide, copper oxychloride [*ibid.*, xiv, p. 562], and 20 per cent. copper phosphate gave interesting indications.

HURST (W. M.), HUMPHRIES (W. R.), LEUKEL (R. W.), & BOERNER (E. G.). Removing smut balls from seed Wheat.—*Circ. U.S. Dep. Agric.* 361, 16 pp., 6 figs., 1935.

In this account of an investigation of the ability of a number of grain-cleaning machines to remove stinking smut [bunt: *Tilletia caries* and *T. foetens*] balls from wheat seed the authors state that bunt balls separated by hand from soft red winter wheat varied from 0.0763 to 0.134 gm. (average 0.0963 gm.) in weight per 10 bunt ball lots as against 0.3063 to 0.3637 gm. (average 0.332 gm.) for the sound grain (10 grain lots), the corresponding average figures for Purplestraw wheat being 0.0795 and 0.3090 gm. The balls appear to differ considerably in size and shape with different physiological forms of bunt [cf. next abstracts] and different wheat varieties. Some are much smaller and others larger than the healthy wheat grain from which they are taken. Preliminary tests made with farm-sized grain-cleaners indicated that some of the balls may be screened out and a large percentage removed by air blast, but complete removal should not be expected with the type of equipment usually employed.

As a result of a large number of experiments, the data from which are tabulated, it was found that grain-cleaning machines of the fanning-mill type were more effective than other types for the removal of bunt balls. By adjusting the air velocity, screen size, and rate of feed it was possible to remove all the bunt balls from infected grain, two machines effecting this in one operation. A blast of air when directed upward against the falling grain was more effective, especially at low velocities,

than when striking the grain at right angles. In general the best results were obtained when the machines were run well below their rated capacity.

HOLTON (C. S.). **Studies on seven differentiating characteristics of two physiologic forms of *Tilletia tritici*.**—*Phytopathology*, xxv, 12, pp. 1091–1098, 3 figs., 1935.

Seven differential characters were recognized in two physiologic forms of *Tilletia tritici* [*T. caries*] attacking Hohenheimer wheat in the State of Washington [*R.A.M.*, xiv, p. 287]. In addition to their varying degree of virulence on the variety concerned—the Pullman form causing an average of only 33 per cent. damage over a three-year period compared with 81 per cent. for that from Lind—the two forms differ in the type of smut [bunt] ball [cf. preceding abstract], prominence of spore-wall reticulations, spore diameter, promycelial length, nuclear behaviour during chlamydospore germination, and relative degree of stunting caused. In the Pullman form the bunt balls are large and elongated, in the Lind small and somewhat rounded; in the former the spore-wall reticulations are relatively inconspicuous, whereas in the latter they are so prominent as to impart a somewhat spiny appearance [cf. *ibid.*, xii, p. 618]. The mean spore diameter (252 spores) of Pullman was found to be $17.85 \pm 0.03 \mu$ as against $19.31 \pm 0.04 \mu$ in Lind, the corresponding figures for promycelial length being $72.60 \pm 1.60 \mu$ and $21.45 \pm 0.39 \mu$, respectively. The nuclei of the Pullman form were scattered during the germination process, while those of Lind remained aggregated. The mean heights of culms of the Hosar variety infected by the Pullman and Lind forms were 99.80 ± 0.52 cm. and 92.84 ± 0.43 cm., respectively, compared with 118.48 cm. for healthy plants. Three of these differences, namely, chlamydospore diameter, promycelial length, and nuclear behaviour, do not appear to have been previously reported. In conclusion the author suggests that characters other than pathogenicity should be considered in classifying the various physiologic forms of *T. caries* and *T. levis* [*T. foetens*].

SCHLEHUBER (A. M.). **Wheat inheritance: reaction to four bunt biotypes, spike density, and seed color.**—*Bull. Wash. St. agric. Exp. Sta.* 323 (Tech. Paper), 32 pp., 5 graphs, 1935.

The F_3 progeny of crosses between Albit and Minhardi and between Albit and Buffum 17 wheats were found to be completely susceptible to two biotypes (T13 and T2) of bunt (*Tilletia tritici*) [*T. caries*: see preceding abstract and *R.A.M.*, xiii, p. 361] virulently attacking all parents, but reactions ranging from immunity to absolute susceptibility were obtained in the same generation inoculated with another biotype (T1) of *T. caries* and one (L5) of *T. levis* [*T. foetens*] which spare Albit while severely infecting Minhardi and Buffum 17. In the F_3 generation of the Albit $\times$ Minhardi cross the four classes, bunt-free, intermediate resistant, intermediate susceptible, and susceptible, gave a close approximation to a 7:4:4:1 ratio to form T1, indicating a two-main-factor difference. The coefficient of correlation between T1 and L5 ($r = 0.956 \pm 0.008$) denotes that the same two main factors responsible for resistance to T1 confer the same reaction to L5. Minhardi introduces

a factor inhibiting the action of A(lbit)¹ against L5 but not against T1. Neither Albit, Minhardi, nor Buffum 17 possess genes for resistance to forms T13 and T2. Segregates more susceptible than Buffum 17 developed among the progeny of the crosses, and it is possible that this variety carries a factor, C, reducing the incidence of bunt and another, Ib, inhibiting the action of both A¹ and A².

CARRÉ (G.). **A propos de la lutte contre le piétin.** [A note in connexion with the campaign against foot rot.]—*J. Agric. prat., Paris*, N.S., xcix, 52, p. 540, 1935.

The yield of mixed plots on silico-argillaceous soil of Vilmorin 27, Hybride 40, and Hybride de Jonquois wheat was appreciably increased and the incidence of foot rot [*Cercospora herpotrichoides*: *R.A.M.*, xv, p. 145] reduced to a minimum at the Wagnonville Agricultural College, Douai, by 500 kg. superphosphate per hect. (a) incorporated with the soil on 5th December, 1934, or (b) applied as a top dressing on 12th April, 1935, the yields per hect. being (a) 3,690 and (b) 4,047 kg., compared with 3,447 kg. for the ordinary fertilizer treatment.

JOHNSTON (W. H.) & AAMODT (O. S.). **The breeding of disease-resistant smooth-awned varieties of Barley.**—*Canad. J. Res.*, xiii, 5, pp. 315–338, 1 fig., 1 diag., 1935.

An account is given of the results obtained up to date in the work which was started in 1929 at the University of Alberta, Edmonton, for the purpose of developing simultaneously smooth-awned and disease-resistant varieties of barley, suitable for the conditions prevailing in Alberta, from reciprocal crosses of the two smooth-awned varieties Glabron and Velvet and the rough-awned Trebi. The part of the work relating to resistance of the progeny to *Ustilago hordei* was reported in previous communications [*R.A.M.*, xiv, pp. 158, 623]. In regard to barley loose smut [*U. nuda*], the authors refer to recent work on the types of barley smut intermediate between *U. hordei* and *U. nuda* [*ibid.*, xiii, p. 691; xv, p. 211], and state that these types doubtless occur in Canada, where the disease is widespread, but as they have not as yet been differentiated no progress has been made in the development of resistant varieties.

A full review is also given of the literature dealing with the methods of infection of barley with stripe (*Helminthosporium gramineum*) [*ibid.*, xiv, p. 746], the temperature relations, physiologic specialization, genetic studies, and methods of inoculation of the causal fungus. In the Edmonton studies of the resistance to stripe of the reciprocal crosses of Trebi and Glabron, the plants were inoculated chiefly with *H. gramineum* obtained from the Canadian Thorpe variety; the inoculation consisted in dipping random ears in the spore suspension and immediately enclosing them in glassine bags which were kept moist by atomizing every four or five days. The grains from the inoculated ears were sown in the spring of 1932 at soil temperatures ranging from 10° to 13° C. The results indicated that the Trebi parent was highly resistant to the form of *H. gramineum* used, 39 plants of 47 being completely immune and 8 showing 3 per cent. infection, while the Glabron barley showed infection ranging from 3 to 28 per cent., the majority

of the lines showing from 8 to 13 per cent. infection. This wide range is considered to suggest the existence of certain limitations in the inoculation methods which were used. There was no evidence of transgressive reaction for greater resistance. In general the results bore out Isenbeck's conclusion [*ibid.*, x, p. 231] that the number of resistant individuals in hybrids increased with the degree of resistance of the two parents, but it is extremely difficult to postulate any definite mode of inheritance of resistance.

A slight positive correlation was found between percentage stripe infection and mean height of the plant, but none between stripe reaction and either mean number of days from emergence or barbing of awns.

H[OWIE] (G. W.). **Improving the returns from Oats. Experiments to prevent the development of leaf stripe disease.**—*Manx J. Agric.*, ii, 1, pp. 36–38, 1 diag., 1935.

Details are given of experiments carried out in 1932 and 1933 at the Knockaloe Experimental Farm, Isle of Man, to determine the efficacy of cerasan (2 oz. per bush.) in the control of leaf stripe of Victory oats [*Helminthosporium avenae*: *R.A.M.*, xv, p. 73 and next abstract]. In 1932 the increased return per acre in the treated plots sown at the rate of 4 bush. per acre was estimated at 13s. 4½d. (with cerasan at 2s. 2d. per lb.) and in 1933 the increased returns per acre for a sowing of treated seed at 6 bush. per acre were 2s. 2½d., at 5 bush., 7s. 8½d., and at 4 bush., £1. 5s. 5½d.

[HOWIE (G. W.).] **Improving the returns from Oats. Results of a further experiment with 'cerasan'.**—*Manx J. Agric.*, iii, 1, pp. 7–8, 1936.

In 1935 the increased returns per acre of oats treated with cerasan (2 oz. per bush.) against leaf stripe [*Helminthosporium avenae*] at the Knockaloe Experiment Farm, Isle of Man [see preceding abstract], were as follows: 6 bush. seed-grain per acre, 3s. 11½d., 5 bush., 9s. 6½d., and 4 bush., £1. 0s. 9d.

VALLEAU (W. D.). **Seed transmission of *Helminthosporium* of Corn.**—*Phytopathology*, xxv, 12, pp. 1109–1112, 1935.

Evidence is adduced that, contrary to the observations of Koehler and Holbert in respect of *Helminthosporium turcicum* in Illinois [*R.A.M.*, x, p. 180], *H. sp.* is commonly present in maize seeds in Kentucky though very liable to escape notice owing to the routine plate-culture methods of investigation. Its presence may be readily determined, however, in surface-disinfected seeds planted in clean sterilized sand in a room with subdued light and maintained for a sufficient length of time at a temperature of about 80° F. [*ibid.*, v, p. 605], being consistently associated in the writer's tests with the development on the seed coats of coal-black markings in contrast to the red and dark olive discolorations characteristic of *Fusarium moniliforme* [*Gibberella moniliformis*] and *Alternaria sp.*, respectively. The longevity of sand-box seedlings from a given ear compared with that of seedlings from other ears appears to be an inherited character and not an indication of the degree of infection of the seeds with pathogenic organisms. Of 269 plants or seed remnants examined *H. sp.* was

detected on 32 seeds (11.9 per cent.) from 13 out of 15 smooth (and thus apparently fungus-free) ears, *G. moniliformis* on 94, and *A. sp.* on 11. The first-named was fruiting abundantly either on the black areas of the seed coats or on the mesocotyl. A perusal of earlier records on pericarp discoloration indicates that 28.5 per cent. of 2,058 seeds of the Boone County White variety and 47.4 per cent. of 1,069 of Reid's Yellow Dent were attacked by *H. sp.* Infection is believed to occur through the silks soon after pollination, the fungus penetrating between the pericarp layers and sometimes forming sclerotoid masses before the complete development of the pericarp walls.

HOLBERT (J. R.), HOPPE (P. E.), & SMITH (A. L.). **Some factors affecting infection with and spread of *Diplodia zeae* in the host tissue.**—*Phytopathology*, xxv, 12, pp. 1113–1114, 1 graph, 1935.

Observations and experiments from 1931 to 1934 in Illinois and Wisconsin have shown that maize stalks damaged by bacterial leaf blight [*Aplanobacter stewarti*: *R.A.M.*, xv, p. 211], artificially defoliated, or infested by second-brood chinch bugs [*Blissus leucopterus*] are liable to more extensive and severe infection by *Diplodia zeae* than those not exposed to such injuries. The last-named pathogen is also more virulent on the stalks of plants allowed to fruit normally than on those in which grain-setting is purposely prevented, while it further prefers the tissues of plants exposed to either natural or artificial chilling and freezing temperatures during the approach to maturity. All these conditions may well involve a reduction in the carbohydrate reserves of the plants which enhances the susceptibility of the stalks (but not necessarily that of the ears) of maize to *D. zeae*.

JOHANN (HELEN). **Histology of the caryopsis of Yellow Dent Corn, with reference to resistance and susceptibility to kernel rots.**—*J. agric. Res.*, li, 10, pp. 855–883, 19 figs., 1935.

This is a detailed and fully illustrated account of the author's histological studies of the development from pollination to maturity of grains of strains of hand-pollinated yellow dent maize, in the attempt to determine anatomical differences which might account for the resistance or susceptibility of the strains to fungus diseases in general [cf. *R.A.M.*, xii, p. 159] and to *Diplodia zeae* [*ibid.*, xv, p. 145] in particular. The only variations noted, which may have a bearing on the problem, were differences in the rapidity with which the hilar orifice is closed, in the thickness and compactness of the closing layer, and in the completeness of the union of the closing layer with the margins of the suberized membrane of the testa. Usually, a delayed and less effective closing of the hilar orifice was found in the strains which were known to be most susceptible in the field. Besides the closing layer being an effective barrier to the advance of the fungi through that region of the grain, it is possible that the process of its formation may be associated with chemical changes in the tissues, which afford a less favourable nutrient medium for the parasites. No anatomical features were observed sufficient in themselves to account for the reaction of various maize strains in the field. *D. zeae* infections were found in almost every case studied to begin at the proximal end

of the maize grain; in some strains the spongy tissues of the pedicel and proximal pericarp were filled with the fungus, while in others only a few straggling hyphae could be observed in these tissues.

PETRI (L.). '**Deuterophoma tracheiphila**' e malattie da virus degli Agrumi. [*Deuterophoma tracheiphila* and virus diseases of Citrus.]

—*R. C. Accad. Lincei*, xxi, 5, pp. 301–306, 1935.

Atanasoff's interpretation of 'mal secco' of lemon and other citrus trees as a virus disease [*R.A.M.*, xiv, p. 505], with *Deuterophoma tracheiphila* [ibid., xv, p. 213] as an insignificant concomitant, is disputed by the writer on a number of grounds: (1) the virulence of Trabut's infectious chlorosis of Algeria (with which 'mal secco' is identified by Atanasoff) to the sweet orange, whereas this host is uncongenial to the agent of 'mal secco'; (2) the weaker virulence of the graft-transmissible infectious chlorosis compared with that of 'mal secco'; (3) the uniform association of *D. tracheiphila* with the disease; (4) the non-transmissibility of the disease from the stock of a diseased tree to a healthy scion unless the former actually contains the fungus (though exceptionally 'mal secco' infection may proceed from the roots) [ibid., ix, p. 645]; (5) the inconspicuous symptoms shown by stocks of diseased trees cut near soil-level (which Atanasoff overlooked); (6) the rapidity of spread of the disease (3,000 hect. of lemon groves being destroyed in Messina and Catania since 1918, whereas if the disease had been introduced with the cultivation of the fruit little would be left to-day); (7) the absence of any foundation for the view that forcing for the early market predisposes to 'mal secco', since in Palestine and Greece forcing is not practised yet there is scarcely a lemon tree left in the island of Chios, while in the Peloponnesus and Crete the losses are enormous; and (8) the comparatively slow diffusion of a virus disease compared with one due to a fungus, such as that causing 'mal secco'.

Encouraging results are said to have been given in the control of the disease by the compulsory excision and destruction of diseased material—the sole means known at present of maintaining infection within reasonable limits and prolonging the life and productivity of the trees.

CARNEIRO (J. G.). **O tratamento das plantas citricas.** [The treatment of Citrus plantations.]—*Rev. citric.*, 7 pp., 6 pl., November, 1935.

Full directions are given for the treatment of citrus groves in San Paulo, Brazil, against a number of the more common diseases [*R.A.M.*, xiii, p. 693], supplemented by brief notes on their etiology and symptoms. Leprosis is one of the most serious diseases, and is characterized by the presence on the fruits of depressed, almost black lesions.

NATTRASS (R. M.). **Prevention of wastage of Citrus fruit in transit.**—*Cyprus agric. J.*, xxx, 4, pp. 84–87, 1935.

Wastage of Cyprus oranges arriving in Europe is caused almost exclusively by blue and green moulds [*Penicillium italicum* and *P. digitatum*, respectively: *R.A.M.*, xiv, p. 742]; other fungi occur occasionally, but are unimportant, even *Diplodia natalensis* [ibid., xii, p. 506] not being found to any great extent, though present on some

of the trees in the older groves. Of the two moulds *P. digitatum* is the more serious.

Prevention of wastage resolves itself mainly into careful handling of the fruit at all stages in order to avoid minute injuries, and all workers handling oranges should be provided, if possible, with cotton gloves.

In preliminary disinfection tests oranges were dipped in 7 per cent. borax solution at 43° C. for 5 minutes [ibid., xv, p. 212], the same for $\frac{1}{2}$ minute, cold saturated borax solution for $\frac{1}{2}$ minute, and shirlan [cf. ibid., xiv, p. 9] 1 per cent. cold dip, a further lot remaining untreated as controls. The fruit was wrapped, boxed, and after transport by rail to Nicosia was stored for 24 days. Counts of rotted fruits showed that the treatments listed above gave, respectively, 8.5, 17, 2, 2, and 20 (control) per cent. infection. Shirlan gave good control, is simple to use, and does not cause excessive wilting, but it leaves a deposit, which must be rubbed off.

In a small trial in which oranges were wrapped in ordinary wrappers impregnated with iodine [ibid., xiv, p. 321], after 30 days' storage the wrapped fruits examined showed 0.6 per cent. wastage, as against 14 per cent. for the unwrapped controls; when storage had lasted 37 days the corresponding figures for the remaining fruit were 0 and 24 per cent. wastage, respectively. A further trial on a large scale on fruit exported to Europe is considered necessary to establish the value of the treatment.

BITANCOURT (A. A.). Um protozoario parasita do Cafeeiro. [A protozoon parasitic on Coffee.]—*Rev. Inst. Café*, x, 107, pp. 2486-2490, 1 fig., 1935.

In connexion with the development, in the coffee plantations of Parahyba and Pernambuco, Brazil, of a disease simulating phloem necrosis, associated in the former locality with an apparently new cochineal insect, *Cerococcus parahybensis*, and in the latter with *Rhizococcus coffeae*, the writer sums up and discusses Stahel's observations on this subject [*R.A.M.*, xiii, p. 367].

MÉTALNIKOV (S.) & MÉTALNIKOV (S. S.). Utilisation des microbes dans la lutte contre les insectes nuisibles. [The utilization of microbes in the campaign against noxious insects.]—*Ann. Inst. Pasteur*, lv, 6, pp. 709-760, 4 figs., 1 diag., 1935.

A detailed, tabulated account is given of the technique and results of the writers' comprehensive experiments in the control of a number of formidable agricultural insect pests by bacteriological methods, which have been found applicable, *inter alia*, to *Pyrausta nubilalis*, *Pieris brassicae*, *Galleria mellonella*, *Ephestia kuhniella*, *Lynantria dispar*, *Gelechia gossypiella*, *Bombyx mori*, and *Gryllotalpa vulgaris* [cf. *R.A.M.*, xiii, p. 766]. The method consists essentially in dusting the insects with a powder containing spores of the appropriate bacteria, which may also be made into an emulsion and sprayed on the plants liable to infestation. *Bacterium pyrenei*, a long, motile, Gram-positive, pink rod, also proved highly pathogenic to *Pyrausta nubilalis*.

RIETSCHEL (P.). **Über zwei Parasiten von *Tenebrio molitor*.** [On two parasites of *Tenebrio molitor*].—*Arch. Protistenk.*, lxxxvi, 2, pp. 349–358, 5 figs., 1935.

Flour beetles (*Tenebrio molitor*) originating in south Germany and examined at the Frankfurt-am-Main Zoological Institute were found to be parasitized by a fungus, *Sporomyxa tenebrionis* n.sp., characterized by apparently amotile, amoeba-like vegetative stages with up to more than one hundred nuclei from which arise smooth-walled, oval spores, 10 by 6 μ . The organism occurs in the connective tissue, fat body, intestines, reproductive organs, and blood of the insects. The other parasite referred to in the title is a sporozoon.

TALICE (R. V.). **Deux cas de sporotrichose produits par le *Sporotrichum* astéroïde de Splendore.** [Two cases of sporotrichosis caused by Splendore's asteroid *Sporotrichum*].—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 576–583, 1 fig., 1935.

The author gives a brief description of two cases of human sporotrichosis in Uruguay, the pus from the lesions of which was found to contain numerous asteroid bodies described in 1908 by Splendore in Brazil (*Ann. Igiene sperim.*, xx, p. 89, 1909) and provisionally ascribed by him to a new species, *Sporotrichum (Rhinocladium) asteroides*. The fungus isolated from the pus did not, however, reproduce these forms in culture, and neither were they observed in animals experimentally inoculated with the organism. Both human strains gave cultures indistinguishable from *R. [S.] beurmanni* [*R.A.M.*, xv, p. 221]. Since similar bodies have also been observed fairly generally in other human and animal diseases, the author considers that their presence in the pus is insufficient to warrant separation of the fungus as a distinct species and regards it as a variety of *R. [S.] beurmanni*. The origin of these bodies is still obscure.

NAEGELI (O.). **Studien über die gegenseitige Beeinflussung von Pilzkulturen auf künstlichen Nährböden (Pilzkolonien als Nährböden für andere Mikroorganismen).** [Studies on the reciprocal influence of fungus cultures on artificial media (fungus colonies as nutrient substrata for other micro-organisms).]—*Schweiz. med. Wschr.*, lxxv, 23, pp. 535–537, 4 figs., 1 col. pl., 1935.

Details are given of experiments with a number of human pathogens, e.g., *Microsporon ferrugineum*, *Hemispora rugosa* [*R.A.M.*, v, p. 363], *Sporotrichum gougeroti*, *S. beurmanni* [see preceding and next abstracts], and *Achorion schoenleini*, from which it appears that symbiosis, synergism, antagonism, and tropism may accompany the development of these organisms on artificial media. The three first-named, for instance, grew on the colonies of a pathogenic *Saccharomyces* on maltose and glucose agar, *Sporotrichum beurmanni* overgrew *A. schoenleini* and hindered its further development, while the last-named literally destroyed the colonies of an *Actinomyces*. The age of the cultures and the quantity and density of the medium are probably decisive factors in the development of these phenomena.

SARTORY (A.), SARTORY (R.), & MEYER (J.). **Étude de l'organisme isolé d'une arthrite sporotrichosique primaire avec métastase vertébrale.** [Study of the organism isolated from a primary sporotrichotic arthritis with vertebral metastasis.]—*C. R. Acad. Sci., Paris*, cci, 27, pp. 1501-1503, 1935.

From the pus of an arthritic lesion on the shoulder of an 18-year-old male, who four months later developed vertebral metastasis, the writers isolated a fungus forming radiating colonies with a crateriform, umbilical, blackish-brown centre and a smooth, whitish periphery. It produced septate hyphae with verticillate branches on the tips and along the sides of which were borne clusters of 4, 6, or 8 ovoid, sessile or shortly pedicellate, creamy-white, later darkening conidia, 4 to 8 by 2 to 4 μ ; and after 48 hours spherical, oval, or cylindrical chlamydospores, 8 to 15 μ in diameter. Gelatine was liquefied and saccharose, maltose, and lactose fermented without gas production. A guinea-pig inoculated intraperitoneally with the organism developed at the site of injection a necrotic abscess, from which the fungus was recovered in an active form. Healing took place spontaneously.

The agent of the condition under observation is allied to *Sporotrichum schenckii* and *S. beurmanni* [see preceding abstracts], from which it differs, however, in the consistency of the colonies, the formation of verticillate branches bearing conidia, and the fermentation of saccharose and lactose; it is accordingly named *S. verticilloides* n.sp.

WILLIAMS (J. W.). **I. Effect of variation of ratios of dextrose to peptone on colonies of certain pathogenic fungi.**—*Arch. Derm. Syph., Chicago*, xxxii, 6, pp. 893-914, 1935.

The writer gives a very detailed account of the response of a number of fungi pathogenic to man to variations in the ratios of dextrose to peptone in the substratum [*R.A.M.*, xiv, p. 510]. The following media were used, all with 1.5 per cent. agar: Sabouraud's (S 4 consisting of 4 per cent. sugar and 1 per cent. peptone), the writer's routine medium (W 1, 4 per cent. peptone and 1 per cent. dextrose), M-5 (6 per cent. peptone and 0.5 per cent. dextrose), W-5 (4 per cent. peptone and 0.5 per cent. dextrose), and W-1 (4 per cent. peptone and 0.1 per cent. dextrose).

On the basis of macroscopic appearance only a rough but convenient classification of the fungi into seven groups is given.

Comparative abundance of growth and relative excellence of morphological differentiation were calculated by means of average indexes for S 4, W 1, and M-5. In respect of the former there was little difference between the three substrata, all of which were suitable; as regards the latter W 1 was superior. S 4 is particularly valuable as showing up pigments not otherwise developed.

ROSENTHAL (J. M.). **Blastomycosis in an infant six months old.**—*J. Lab. clin. Med.*, xx, 11, pp. 1164-1165, 1935.

The organism isolated from miliary epidermal abscesses in a six-months-old infant in Pennsylvania was a round, double-contoured,

budding, yeast-like cell, 10 to 12 μ in diameter, which was identified as *Cryptococcus gilchristi* [*Endomyces dermatitidis*: *R.A.M.*, xv, p. 154]. On glucose agar a white, flocculent (oidial) mycelium was formed in which were embedded spore-like elements, discernible under the action of a thionin stain. A complete recovery was effected by means of potassium iodide and X-ray applications.

DE MONBREUN (W. A.). **Experimental chronic cutaneous blastomycosis in monkeys: a study of the etiologic agent.**—*Arch. Derm. Syph.*, Chicago, xxxi, 6, pp. 831–854, 9 figs., 1935.

From verrucose facial lesions of nine years' duration in a 68-year-old farmer the writer isolated a fungus characterized in infusion broth at P_H 7.2 by hyphae measuring 1.5 to 3 μ in width, round to oval conidia, 4.5 by 3 μ , sessile or borne on sterigmata 1 to 10 μ long, and intercalary and lateral, thick-walled, spherical chlamydospores. 8 to 15 μ in diameter, the germination of which in the tissues initiates the primary yeast-like phase of infection. The organism grew best at 25° C., but developed to some extent at 8° and from 28° to 38°; it produced neither acid nor gas in sugar-containing media but induced slight alkalinity in milk and slowly liquefied gelatine. The fungus was identified by Castellani with *Monosporium tulanense* [*R.A.M.*, xiii, p. 235]. It is cultivable either in the yeast-like form assumed in the lesions or as a mycelium.

Lesions typical of cutaneous blastomycosis in man were induced in three monkeys (*Macacus rhesus*) by means of subcutaneous and intra-dermal injections of cultures of the causal organism. In these animals, as in man, the disease tends to become systemic and chronic.

GOUGEROT (H.) & LORTAT-JACOB (E.). **'Pityriasis versicolor' achromiant d'emblée, tardif, extensif, abortif, s'arrêtant, puis guérissant sans traitement.** [Pityriasis versicolor, achromatic from the onset, belated, extensive, abortive, becoming arrested, and healing without treatment.]—*Bull. Soc. franç. Derm. Syph.*, 1935, 9, pp. 1795–1800, 1935.

Clinical details are given of three cases of achromatic pityriasis versicolor (*Malassezia furfur*) [*R.A.M.*, xiv, p. 169] developing as a belated sequel to sun-bathing (a fortnight or more after the last exposure) and assuming a considerable extension during the next 15 to 20 days, at the end of which further spread of the fungus is arrested and healing occurs spontaneously.

BAUDET (E. A. R. F.). **Sur une dermatomycose du chien, à l'aspect de favus, produite par un Trichophyton à culture faviforme.** [Note on a favus-like dermatomycosis of the dog, caused by a *Trichophyton* with faviform cultures.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 568–575, 2 pl., 1935.

From dermatomycotic material obtained from faviform lesions on a dog in Utrecht, the author isolated a fungus which formed on the media already used by him in similar work [*R.A.M.*, xii, p. 172] colonies typical of a faviform *Trichophyton*. These cultures remained sterile for several weeks but later developed a few aleuria. Secondary

cultures on beerwort agar showed aleuria, spindles, protoplasmic agglomerations, and dichotomous branching. On inoculation into healthy dogs and guinea-pigs the fungus produced crusted lesions containing both hyphae and spores. The fungus was recovered from these lesions and gave faviform cultures which when over 15 days old produced both aleuria and spindles. Favus of animals is attributed to *Microsporon*, but in this case whilst the lesion is that of favus, the macroscopic aspect of the culture is that of a faviform *Trichophyton*, though the formation of aleuria and spindles brings the fungus close to *Microsporon*. These results are considered to be a further argument against the validity of the binomial *T. faviforme* [loc. cit.].

TALICE (R. V.). **Sur un cas de maduromycétome à grains rouges observé à Montevideo.** [On a case of red-grained madura-mycetoma observed in Montevideo.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 584–590, 1 fig., 1935.

A very brief description is given of a fungus which was observed in fixed material obtained from a mycetoma on a Uruguayan adult in Montevideo, characterized by red grains containing voluminous and distinctly septate hyphae, 2 to 3 μ in diameter, producing numerous, thick-walled, terminal or intercalary, vacuolated bodies, of variable size, which may be interpreted as chlamydospores; sometimes they filled the centre of the grain while interstitial matter appeared to be very sparse. Morphologically the organism is typical of the genus *Madurella* [*R.A.M.*, xi, p. 242], but owing to the fact that the fungus studied by the author caused the formation of red grains in the lesions, while those due to *Madurella* are always brown or black, a new genus *Rubromadurella* is created for this fungus, for which the binomial *R. langeroni* is suggested [without Latin diagnosis for either genus or species].

MILOCHEVITCH (S.). **Une nouvelle espèce pathogène de Ctenomyces, Ctenomyces bossae n.sp.** [A new pathogenic species of *Ctenomyces*, *C. bossae* n.sp.]—*Ann. Parasit. hum. comp.*, xiii, 6, pp. 559–567, 3 pl., 1935.

The fungus described in this paper was isolated from ringworm lesions of the endothrix type on the lip, chin, and neck of a student in Jugo-Slavia; similar lesions were also produced by inoculation into the guinea-pig. On glucose media it formed green, circular, downy colonies, raised at the centre, surrounded by a broad white outer zone bearing less dense, longer, and more erect aerial hyphae, and then by a colourless halo, 2 to 3 mm. broad, consisting of densely crowded, unequal, and very fine rays. After 25 days the cultures were entirely green except at the periphery. On maltose media the characters were very similar, and on both pleomorphism developed very slowly. On wheat flour agar and other media the fungus formed abundant spores, either on *Acladium*-like structures or in racemes with perpendicular branches, large numbers of elongated multicellular spindles, long and typical spirals, coremia composed of long and fine hyphae, and finally thick, torulose hyphae with crosier-like ends. This richness of morphological forms, as well as cultural similarity to *C. (Trichophyton) persi-*

color [*R.A.M.*, xiv, p. 35], induce the author to refer it to the genus *Ctenomyces* [*ibid.*, x, p. 243], but as it differs from the species mentioned in its green, diffusible pigment, its slow pleomorphism, its decided pathogenicity to the guinea-pig, its torulose hyphae, and abundant development of spindles, it is regarded as a new species and named *C. bossae* n.sp. [without a Latin diagnosis].

CIARROCCHI (L.). **Dermatomicosi da Scopulariopsis brevicaule.** [Dermatomyces due to *Scopulariopsis brevicaulis*.]—*G. ital. Derm. Sif.*, lxxvi, 6, pp. 1409–1421, 1 pl., 1935.

While onychomycoses due to *Scopulariopsis brevicaulis* [*R.A.M.*, xv, p. 20] are relatively frequent, the records of dermatomycoses resulting from this cause are stated to be extremely scanty; hence particular interest is considered to attach to the present detailed account of a case signalized by erythemato-squamous lesions on the right forearm of a male patient treated by the writer in Rome. The fungus isolated from the affected area was identified by Langeron as *S. brevicaulis*, and its somewhat atypical behaviour in culture is not regarded as justifying the establishment of a distinct species. Animal inoculation experiments gave conclusive results on mice only.

MINET (J.) & BRIDOUX. **Broncho-pneumonie aiguë mortelle à Aspergillus fumigatus et Rhizomucor parasiticus.** [A fatal case of acute broncho-pneumonia due to *Aspergillus fumigatus* and *Rhizomucor parasiticus*.]—*Pr. méd.*, xliii (i), 25, p. 498, 1935.

A rapidly fatal case of acute broncho-pneumonia in a somewhat atypical form is recorded in a 35-year-old woman in the Lille district of France. From the sputum were isolated in the early stages *Aspergillus fumigatus* [*R.A.M.*, xv, pp. 19, 20, 222], *Rhizomucor* [*Rhizopus*] *parasiticus* [*ibid.*, viii, p. 104], and a few staphylococci, while subsequent analysis yielded the first-named alone in a pure state. It is thought that *R. parasiticus* may have stimulated the *Aspergillus* to unwonted activity, its pathogenicity not being ordinarily of such an extreme type.

DESSY (G.) & CELLINA (M.). **Patogenesi dell' infezione sperimentale da Mucor pusillus.** [The pathogenesis of experimental infection by *Mucor pusillus*.]—*Boll. Ist. sieroter. Milano*, xiv, 9, pp. 861–879, 8 figs., 1935. [German summary.]

A detailed account is given of the writers' inoculation experiments with *Mucor pusillus* [*R.A.M.*, xiv, p. 511] on laboratory animals, from which it appears that the fungus is pathogenic to rabbits, guinea-pigs, pigeons, and white mice by intravenous injections, but not to white rats or dogs. The lungs, kidneys, liver, and spleen are the organs chiefly involved. All attempts at immunization of the animals were unsuccessful.

SHAW (F. W.). **An abridged key to the species of pathogenic fungi.**—*J. Lab. clin. Med.*, xxi, 3, pp. 243–257, 1935.

This key is intended for use as a companion to the author's 'Abridged key to the genera of human pathogenic fungi' published in

the same *Journal* in 1934. Synopses are given of most of the pathogenic species comprised in each genus, the more common saprophytic representatives of which are also listed.

Der beste Schwefelverdampfungsapparat. [The best sulphur vaporization apparatus.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 52, p. 630, 1935.

In response to a reader's inquiry concerning the best sulphur vaporization apparatus, three rose-growers declare themselves to be satisfied with Rupprecht's 'Sulfurator' [*R.A.M.*, xiv, p. 313], which in one case is reported to have controlled mildew [*Sphaerotheca pannosa*: *ibid.*, xv, p. 202] to the extent of 95 per cent. The bellows action, however, is considered to call for some improvement. An area of 8,500 sq. m. can be covered by two men using the large 50 kg. apparatus in 1½ to 2 hours. For areas up to 2,500 sq. m. the medium-sized apparatus is recommended, whereas the small 'Sulfurator' has been found inadequate. Good results are reported by one correspondent with a sulphur vaporization apparatus supplied by R. v. d. Kammer, Dahmsdorf, Gr. Kreutz.

TAKIMOTO (S.). Bacterial plant diseases in Japan. I. A white rot of Hyacinth.—*Ann. phytopath. Soc. Japan*, v, 2, pp. 145-149, 3 figs. 1935. [Japanese, with English summary.]

The agent of white rot of hyacinths [cf. *R.A.M.*, xiii, p. 99] in Japan is stated to be morphologically and physiologically identical with *Bacillus aroideae* [*ibid.*, xiii, pp. 194, 274; xiv, p. 473], a plurivorous plant pathogen distinct from Wakker's yellow rot organism (*Pseudomonas hyacinthi*) [*ibid.*, xiii, p. 207].

LINDQUIST (J. C.). La 'quemadura' de las hojas de Narcisos y Jonquillos (*Stagonospora curtisii*). [Leaf scorch of *Narcissus* and Jonquils (*Stagonospora curtisii*).]—*Rev. argent. Agron.*, ii, 7, pp. 237-244, 4 figs., 1935.

The writer, following Creager and C. O. Smith, describes the symptoms, discusses the etiology, and briefly indicates measures for the control of *Stagonospora curtisii*, the agent of leaf scorch of *Narcissus pseudo-narcissus* and *N. tazetta* [*R.A.M.*, xiv, p. 448], which was observed in the Argentine in 1930 and again occurred in 1935 in a virulent form at La Plata. The pathogenicity of the fungus was demonstrated by inoculation experiments on the above-mentioned hosts.

PARSCHE (F.). Über die Kalkchlorose der Lupine. [On lime chlorosis of the Lupin.]—*Z. PflErnähr. Düng.*, A, xli, 5-6, pp. 282-312, 1935.

The writer's experiments [which are fully discussed and the resulting data tabulated] at Tetschen-Liebwerd [Czecho-Slovakia] showed that lime-induced chlorosis of lupins [*R.A.M.*, xiii, pp. 9, 33; cf. also xv, pp. 110, 227] is most severe on the yellow (*Lupinus*) [*luteus*] and least so on the perennial (*L. perennis*), the white (*L. albus*) and blue (*L. angustifolius*) being intermediate in their response.

Manganese being antagonistic to iron, the manganese content of the

seeds was analysed and found to be generally high, especially in *L. albus*. In the yellow lupin it was possible to induce, by excess applications of manganese, a form of chlorosis curable by means of iron, but the amounts of the former element present in the seed are not regarded as sufficient to explain the phenomenon under consideration. A study of the relevant American and Russian literature would appear to indicate that the ammonia accumulating in the diseased plants brings about an alkalization of the tissue juices and thereby renders the iron ineffective. Weight was lent to this hypothesis by experiments in which the application to yellow lupin seedlings of top dressings of various ammonium salts induced typical chlorotic symptoms curable by treatment with iron.

NILSSON-LEISSNER (G.). **More new host species of the Clover stem rot (*Sclerotinia trifoliorum*).**—*Bot. Notiser*, 1935, 6, pp. 505–506, 1 fig., 1935.

The exceptionally mild winter of 1934–35 proved conducive to widespread activity on the part of *Sclerotinia trifoliorum* in the Svalöf district of Sweden, where not only all the commonly grown leguminous crops but a number of farm weeds and other plants were attacked [in addition to those previously mentioned: *R.A.M.*, xiv, p. 315], namely: *Trifolium filiforme*, *Senecio vulgaris*, *Sonchus asper*, *S. oleraceus*, *Taraxacum* sp., *Plantago lanceolata*, carrot, swede, *Capsella bursa-pastoris*, and 11 other weeds. Successful inoculation experiments have been carried out with apothecia of the fungus on *S. oleraceus*, *Senecio vulgaris*, and *Stellaria media*.

CARNE (W. M.). **Apple investigations in Tasmania: miscellaneous notes.**—*J. Coun. sci. industr. Res. Aust.*, viii, 3, pp. 223–224, 1935.

After referring to a report by N. E. Holmes, C. R. Furlong, and J. Barker in which it is stated that bruising was the main factor in determining the development of breakdown [*R.A.M.*, x, pp. 114, 116] in a consignment of Jonathan apples received in London from Australia in 1934, the author points out that bruising is always a potential stimulus to breakdown [see next abstracts] in this variety but is as a rule one of its least important causes in local cool-stored fruit. Breakdown following bruising is relatively slow in its onset, and when present is often masked by more rapidly developing forms of the disorder. In 1934 and 1935, when other breakdowns were comparatively rare in Tasmanian Jonathan apples, breakdown in experimental lots was practically confined to bruised fruit during and after cool storage for periods up to 18 weeks.

CARNE (W. M.) & MARTIN (D.). **Apple investigations in Tasmania: miscellaneous notes.**—*J. Coun. sci. industr. Res. Aust.*, viii, 4, pp. 271–276, 1935.

In experiments conducted in Tasmania, Sturmer, French Crab, and Jonathan apples in anti-scald oiled wrappers were stored in containers, the carbon dioxide content of which was allowed to reach pre-determined levels ranging from 1.8 to 24.5 per cent. and was then held there

by blowing in air daily. In 1934, the mean storage temperature was 34° F. and in 1935, 32°, and the storage periods were 10 and 8 weeks respectively.

The data obtained [which are tabulated and discussed] showed that of the three varieties French Crab was the most susceptible to brown heart [*R.A.M.*, xiv, pp. 592, 770] and alcoholic poisoning [*loc. cit.*], Jonathan showing no susceptibility to the latter. Liability to both conditions increased with increase in the carbon dioxide concentration. Slight injury from brown heart and still less from alcoholic poisoning occurred in French Crab at carbon dioxide concentrations of under 3 per cent., and in Sturmer at those under 6 per cent., but no injury was observed in Jonathan at concentrations under 8 per cent. Injury apparently increased with maturity at picking in French Crab and Jonathan, but not in Sturmer. Low temperature breakdown [see preceding and next abstracts] appeared only in Jonathan, and increased with maturity at picking, carbon dioxide concentration, and storage duration; it is thought that French Crab and Sturmer would probably behave similarly in years of higher susceptibility to breakdown.

Delay in ripening was progressively more marked at concentrations rising from over 1 to about 5 per cent. On the whole, the best results as regards ripening and freedom from injury were given by carbon dioxide concentrations of 2 to 3 per cent. In such a year as 1935 the most suitable carbon dioxide concentration for a mixed consignment of Tasmanian apples stored at 32° was apparently 2 per cent.

Some Apple disorders experienced in the storage of Apples.—*Tasm. J. Agric.*, vi, 4, pp. 145-149, 4 figs., 1935.

Brief, popular notes are given on the following non-parasitic storage disorders of apples in Tasmania, viz., Jonathan spot (which is seldom important in fruit exported overseas) [*R.A.M.*, x, p. 467; xii, p. 574], deep scald [*ibid.*, xiv, p. 769], and sleepiness or breakdown of Jonathan apples in mainland Australian markets associated with radial water-core [*ibid.*, xiv, p. 701 and next abstracts].

In an experiment with Huon Jonathan apples in 1935 it was found that with any individual tree the larger fruits were more susceptible to Jonathan spot than smaller ones, while the fruits from heavily cropping trees were more susceptible than those from lightly cropping ones. In another experiment apples placed in storage 3 weeks, 1 week, and immediately after picking developed subsequently nearly 50 per cent., 11 per cent., and a negligible amount of spotting, showing the importance of cooling the fruit to 40° F. or under within a few days of picking.

Susceptibility to radial water-core increases with maturity and size of the fruit, and the condition appears earlier and is more severe in lighter than in heavier crops. When water-core is present relatively high temperatures are followed by rapid breakdown. During storage much of the water-core originally present may disappear, but the fruit is liable to become soft, mealy, and prematurely over-ripe or it may turn brown. At the first sign of radial water-core the picking should be completed without delay, beginning with the lighter-cropped trees. The maximum proportion of apples showing water-core should not

exceed 5 per cent. in any consignment except when destined for immediate sale locally.

CARNE (W. M.) & MARTIN (D.). **Breakdown in Tasmanian Apples.**—*J. Coun. sci. industr. Res. Aust.*, viii, 4, pp. 265–270, 1935.

Investigations into non-parasitic wastage in Tasmanian apples conducted since 1928 showed that a number of the more important varieties are subject to low temperature breakdown [*R.A.M.*, xiv, p. 770 and preceding abstracts], liability to which varies in different seasons and is the main cause of the seasonal variation in average wastage.

In varieties subject to this disorder the presence of bitter pit [*ibid.*, xiv, p. 639], which usually develops more rapidly at high than low temperatures, increases liability to low temperature breakdown.

A third important form of breakdown is that associated with water-core [see preceding and next abstracts]. The breakdown in Jonathan, King David, and French Crab apples from Tasmania which usually occurs in Australian mainland markets each year from about May is largely due to the presence of water-core when the fruit is picked.

Liability to all three conditions is greatest in fruits from the most lightly cropping trees, which ripen earliest and form a large part of the first consignments each season. This explains why 'over-ripeness' breakdown of Cox's Orange Pippin and Ribston Pippin is more common in early than in later shipments. With alternately bearing trees the 'on' crop is much less susceptible than the 'off' crop. Liability to low temperature breakdown is greatest in seasons of cool summers, the best years being those of relatively high mean January and February temperatures. Differences in liability to breakdown between trees of similar crop weight on different soils under similar climatic conditions are mainly due to the effect of the physical characters of the soils on the incidence of bitter pit. As a rule the better soils produce fruit of better keeping quality than do poorer soils.

Varieties very susceptible to low temperature breakdown should not be stored at temperatures as low as 32° to 34° F.; in seasons with cool summers 38° is the minimum safe temperature unless the fruit is picked very early. Cox's Orange Pippin and Ribston Pippin are very susceptible, Jonathan, Scarlet, Sturmer, and French Crab susceptible, and Worcester Pearmain, Democrat, and Crofton resistant. Cleopatra is resistant unless pitted and Delicious unless severely water-cored. Resistant varieties have a relatively low level of titratable acidity and a low soluble carbohydrate content. Relatively high acidity, high soluble carbohydrate content, and slow starch loss accompany susceptibility to all three types of breakdown. Such conditions occur in seasons when the January and February temperatures are below normal. During the last two seasons predictions of the relative incidence of breakdown, based on tests of representative samples of fruit before picking and a study of the climatic factors, have been made with considerable accuracy.

The paper concludes with recommendations for control based on the necessity for picking, storing, and shipping the fruit in relation to the varieties concerned, their susceptibility, the crops on individual trees,

and seasonal climatic conditions; susceptible varieties should be segregated in storage at suitable temperatures.

GREGORY (J. H.). **Water-core in Apples.**—*Qd agric. J.*, xliv, 6, pp. 748–750, 1935.

Field observations have shown that apples not unduly affected with water-core [see preceding and next abstracts] grow out of the trouble in two or three weeks, but in experiments with harvested fruit [which are described] no improvement was obtained either by common storage or by cold storage at 34° to 35° F. Affected fruits should therefore be allowed to remain on the trees long enough for recovery to take place.

TILLER (L. W.). **Notes on the cold storage of the Cox's Orange Pippin, 1935.**—*N.Z. J. Sci. Tech.*, xvii, 3, pp. 536–540, 1935.

Cox's Orange Pippin apples picked from trees carrying very light crops at the Research Orchard, Nelson, New Zealand, were found to show very poor keeping quality even under favourable cold storage conditions. It is believed that an improvement in average export quality would result from the elimination of large-sized fruits from light-crop trees. Fruit suffering from water-core [see preceding abstracts] is extremely susceptible to internal breakdown in cold storage and by no means immune from this disturbance in ordinary air storage, so that the exclusion from export of Cox's affected by water-core is also very important. The disease occurs chiefly in the highly coloured 'Extra Fancy' grade fruit growing in exposed positions on the tree, while the 'Good' apples, largely drawn from well-shaded portions, are particularly subject to bitter pit. At cold storage temperatures fruit suffering from water-core is seldom affected by bitter pit, and vice versa. High flesh temperatures (up to 106° F.) have been recorded in exposed apples on the trees, this being apparently a contributory factor in the inducement of water-core. The incidence of pitting on the trees was not materially modified by continual heavy irrigation during the eight weeks preceding picking, and this practice further failed to reduce susceptibility to internal breakdown in cold-stored fruit from trees bearing fruit of a given size. Fruit from a lightly laden, irrigated tree showed much more severe bitter pit and correspondingly less water-core and breakdown than that from an irrigated tree bearing a heavy crop.

HOCKEY (J. F.). **Notes on scab control.**—*Rep. N.S. Fruit Grs' Ass.*, pp. 111–112, 1935.

During 1935 late infection of apple fruits by scab [*Venturia inaequalis*] was conspicuously absent from most varieties in Nova Scotia, though there were pronounced exceptions in some districts. The July application of Bordeaux mixture is the best and cheapest means of controlling late scab yet found, and is recommended as a follower to any spray schedule. After several years' trial the 60 per cent. iron sulphate mixture [*R.A.M.*, xiv, p. 495; xv, p. 159] is recommended for the pre- and post-blossom applications, this weaker mixture giving better-finished fruit than the full strength mixture and almost equally good scab control. Followed by Bordeaux mixture 3–10–100 as a July spray it gave excellent results commercially.

Fruit russetting was quite prevalent on apples in Nova Scotia in 1935, especially from Bordeaux sprays, which should be used for the first two and last applications only. During very hot weather sulphur sprays occasionally cause russetting and in 1935 some of the wettable sulphur did so soon after the calyx spray.

CROWELL (I. H.). **The Cedar Apple rust and its control.**—*Proc. nat. [U.S.] Shade Tree Conf., 1935*, pp. 80–83, [? 1935].

This account of the cedar apple rust (*Gymnosporangium juniperi-virginianae*) and its control in the United States is a short, popular version of papers already noticed from another source [*R.A.M.*, xiii, p. 780; xiv, p. 771].

KIVILAAN (A.). **Viljapuu-Seenväkh, Nectria galligena Bres., selle esinemisest Lõuna-Eestis ja tõrjest.** [The occurrence and prevention of Apple canker, *Nectria galligena* Bres., in southern Esthonia.]—*Bull. phytopath. Exp. Sta. Univ. Tartu* 32, 52 pp., 15 figs., 1 map, 1935. [English summary.]

The old-established apple canker caused by *Nectria galligena* [cf. *R.A.M.*, vii, p. 676; xiv, p. 338, 794] in Esthonia affects a large number of indigenous and foreign apple varieties, the latter including Alexander, Antonovka, Calvill, Winter Golden Pearmain, Beauty of Boskoop, Delicious, and Ontario, and is also found on pears [*ibid.*, x, p. 253]. In the orchard it causes an apple rot with the formation of conidia and perithecia on the rotten fruit. The fungus developed well on oatmeal agar, and when inoculated through wounds in the bark (but not otherwise) it induced canker formation, even on such resistant varieties as Liivima Sibulõun and Leedu Pippin. Of the total number of apple trees in southern Esthonia, only 31·2 per cent. of those in country orchards are affected by canker as compared with 73·9 per cent. in the towns, where crowding is thought to favour the spread of infection.

N. cinnabarina [*ibid.*, xiii, p. 732] occurs in a parasitic form on apple, plum, ash, elm [*ibid.*, xiv, p. 665], *Ribes* [*ibid.*, ix, p. 321], and various ornamentals in Esthonia; a list is given of all its known hosts in the country. Lime (*Tilia cordata*) and ash trees are liable to infection by *N. coccinea* [*ibid.*, viii, p. 289; xii, p. 44; xiii, p. 732], while *Rhamnus frangula* has been found harbouring *N. punicea* [*ibid.*, vii, p. 676].

ROBERTS (J. W.). **An Apple canker caused by *Monochaetia mali*.**—*Phytopathology*, xxv, 12, pp. 1116–1117, 1 fig., 1935.

Since 1910 the writer has occasionally observed an apple canker caused by *Monochaetia mali* [*R.A.M.*, xii, p. 396], and in 1911 he carried out successful inoculation experiments with the fungus, which enters through deep wounds, penetrates far into the wood, and subsequently attacks the resulting wound callus, producing numerous fruiting bodies. In 1934 the canker, which somewhat resembles that due to *Nectria galligena* [see preceding abstract], was found on apple by L. Pierce in Indiana.

SHERBAKOFF (C. D.) & McCLINTOCK (J. A.). **Effect of crown gall, hairy root, and woolly aphids on Apple trees in the orchard.**—*Phytopathology*, xxv, 12, pp. 1099–1103, 1935.

The results [which are discussed and the statistical data tabulated] of an experiment, involving 1,200 apple trees of 13 varieties, to determine the relation of crown gall [*Bacterium tumefaciens*], hairy root [*Bact. rhizogenes*: *R.A.M.*, xv, pp. 82, 206], and woolly aphids [*Eriosoma lanigerum*] to the heavy losses occurring in Tennessee orchards indicated that after three seasons' growth 54.6 per cent. of the trees with heavy insect infestation at planting time (the spring of 1923) were killed, while the figures for large crown galls, extensive hairy root, and apparent soundness were 34.1, 18.6, and 4.9 per cent., respectively. Similar results were obtained with trees dug up in December, 1928. The planting of trees showing such defects is therefore clearly unsafe.

HURT (R. H.). **Spraying and dusting Peaches for brown rot control.**—*Amer. Fruit Gr.*, lv, 7, pp. 7, 13, 1 fig., 1935.

The writer has found that the best control of peach brown rot (*Sclerotinia cinerea*) [*S. fructicola*: *R.A.M.*, xv, p. 161] in Virginia is given by a pre-harvest treatment of the fruit either with flotation sulphur or a new pink sulphur blending into the colour of the fruit and applicable as a spray or dust. Any form of wettable sulphur used as a spray should be applied at a minimum of 400 lb. pressure and at the rate of 3 lb. of the dry form or 5 lb. of paste per 100 galls. solution. Very promising results are stated to have been obtained with specially installed dust chambers which were added to the packing equipment by a number of local growers in 1934.

BANFIELD (W. M.). **Studies in cellular pathology. I. Effects of cane gall bacteria upon gall tissue cells of the Black Raspberry.**—*Bot. Gaz.*, xcvii, 2, pp. 193–239, 1 pl., 1 fig., 1935.

In the investigations described in some detail in this paper the author showed that the bacteria causing cane gall of black raspberries (*Rubus occidentalis*), generally attributed to *Bacterium tumefaciens* but probably due to a distinct organism [*R.A.M.*, ix, p. 395], in the United States are found primarily between cell walls of infected tissue, whence in the form of zoogloeoal strands they penetrate throughout the gall tissue by dissolving the middle lamellae of the cell walls. Numerous degenerating protoplasts may become filled with bacteria in certain areas of the gall tissue and the bacteria may also occur in cavities resulting from lysis of masses of protoplasts and the cell walls. In the early stages of gall formation, cells at a distance from the bacteria may divide repeatedly, until the morbid tissue thus formed is invaded intercellularly by the organism, when the process is repeated farther away in the tissue; eventually, however, cell division ceases, the whole gall is invaded intercellularly by the bacteria and begins to degenerate owing to the lytic effect of the organism on the host cells with which it is in direct contact; such cells succumb either to cytolysis or autolysis [cytological details of which are given], and their place is fully

occupied by compact masses of the bacteria. Superficial discharge of the bacteria from the gall was frequently observed through the inter-cellular spaces formerly occupied by zoogloea.

While the visible structure of the cytoplasm of healthy black raspberry cells, such as those of the root tip, is that of a polyphasic complex composed of a clear, structureless ground substance, containing dispersed spherical, rod-like or thread-like mitochondria, spherical fat globules, and larger starch-bearing plastids, that of the morbid cells may be granular, alveolar, reticular, or it may appear as various three-dimensional open net-work patterns. Some evidence was obtained by micro-dissection and attempted culture of the non-bacterial nature of rod-shaped bodies of bacterial proportion seen in living cells of gall tissue, and cytological methods for the differentiation of the bacteria from these bodies are indicated.

AINSWORTH (G. C.). **Fig mosaic.**—*J. R. hort. Soc.*, lx, 12, pp. 532-533, 1 pl., 1935.

A White Ischia fig growing in a pot under glass at Cheshunt developed leaf symptoms resembling those of mosaic [*R.A.M.*, xiii, p. 356; xiv, p. 462]. Some of the leaves showed irregular, yellowish-green blotches, often with pale margins and up to half an inch or more across, distributed on the blade with little relation to the veins; others showed pale green spots or bands usually associated with the larger veins and often with narrow, reddish-brown margins. The coloured areas were quite superficial, and were inconspicuous on the lower leaf surface. Many leaves appeared to be normal, and the distribution of the mottled leaves was rather irregular. On any one twig as a rule all the leaves appeared to be healthy or most were diseased, but there were more branches with affected leaves on one side of the tree than on the other. The leaves were not noticeably deformed, and only a few of the fruits were spotted. Although there is no published record of fig mosaic in Great Britain the disease is fairly common in this country, where it has been known for at least twenty years. Stocks should never be propagated from affected trees.

ROBINSON (R. H.). **Sprays, their preparation and use.**—*Sta. Bull. Ore. agric. Exp. Sta.* 336, 30 pp., 1 fig., 1935.

In this bulletin the author outlines some reliable methods for the home-made preparation of insecticides and fungicides and emphasizes the precautions that must be taken to ensure the best results. General information is given regarding the physical and chemical properties of the different commercial products, accompanied by notes on their stability, compatibility with other sprays, and effectiveness. The paper concludes with a compatibility chart for the products in common use.

PITTMAN (H. A. J.). **Bordeaux mixture.**—*J. Dep. Agric. W. Aust.*, 2nd Ser., xii, 4, pp. 410-427, 7 figs., 1935.

After briefly referring to the discovery of Bordeaux mixture and listing the advantages and disadvantages attendant upon its use, the author gives detailed instructions for its preparation at home in large or small quantities. Directions are added for the incorporation of

suitable spreaders in the mixture and the preparation of Bordeaux paste.

GARBOWSKI (L.). **Zasady a sposob prowadzenia rejestracji chorób roślin.** [Principles underlying the registration of plant diseases and their application.]—*Rocz. Ochr. Rośl.*, Cz. A (Choroby roślin), ii obejm. okres 1931–1933 r. [*Plant Prot. Yearb.*, Ser. A (Plant diseases), ii for the period 1931–1933 incl.], Bydgoszcz, pp. 395–405, 1935.

In this paper the author briefly explains, for the benefit of the various research workers of the Plant Protection and Agricultural Experiment Stations in Poland [see above, p. 279], the theoretical purposes of the survey of plant diseases now being carried out throughout the country, and gives directions regarding the manner in which local observations should be recorded and systematized before being submitted to the central authorities.

BROOKS (F. T.). **Some aspects of plant pathology.**—*Rep. Brit. Ass.*, 1935, pp. 169–188, 1935.

In this Presidential address to the botanical section of the British Association delivered at Norwich in 1935, the author surveys recent progress made in various branches of plant pathology, particularly those aspects of interest to general botanists, the topics dealt with including the epidemiology of the cereal rusts (*Puccinia* spp.), the relation of environment to disease, biologic races of fungi, the relation between host and parasite, the influence of one fungus on another in the establishment of disease, and functional disease.

SMITH (K. M.) & DONCASTER (J. P.). **The preparation of gradocol membranes and their application in the study of plant viruses.**—*Parasitology*, xxvii, 4, pp. 523–542, 6 figs., 1 graph, 1935.

In this paper, the first of a forthcoming series, a detailed account is given of the technique established after three years' study by the authors for the preparation of Elford's gradocol membranes [*R.A.M.*, xv, p. 168] and of their application to the study of plant viruses. The ether-alcohol collodion forming the basis of the membranes was the same as that used by Elford, and all the other reagents were prepared by Elford's method.

As the least trace of water affects the pore size of the membranes the reagents must be absolutely water-free. To avoid errors from ageing and evaporation the ether-alcohol collodion (Necol) is mixed immediately on arrival at the laboratory with equal parts by weight of acetone, the mixture being stored in dried, stoppered 1-l. bottles. The collodion N 8/40 (1:9) was made up in fairly large quantities, and to ensure homogeneity each freshly made lot of collodion solution used was shaken for at least two hours, after each addition of the reagents, on an electrically driven shaker.

Each cell used for evaporating the collodion solution was constructed of two square plates of optically ground plate glass, a circular hole being cut in one plate, which was then cemented on to the other. Two cells 40 and 20 cm. in diameter were used, the former yielding

30 to 35 and the latter 7 or 8 filtration disks. In order to secure uniformity of pore size, it is essential that the cell in which the membrane is poured should be perfectly level.

The chamber in which the membrane is poured is one of the most important factors in producing uniform membranes. That used measured 9 ft. high by 3 ft. square and had double cavity walls 2 in. thick made of Beaver board. The front opened outwards to a height of 6 ft. 6 in. All the pouring operations were effected through a small glass inspection window 3 ft. 6 in. from the ground. The heating units consisted of five candle lamps controlled by a mercury-toluol thermostat set at 22.5° C., a temperature maintained without more than half a degree variation. While the membrane was setting a paper or cardboard hood placed over the cell prevented air currents and controlled evaporation. At the end of the evaporation period the action of the solvents was stopped by flooding the cell with distilled water. The membrane was removed from the cell as soon as it had shrunk away from the edges, and if large was then cut up into quarters or punched into disks. The material was then washed for a further 14 days with two changes of distilled water daily. The disks were sterilized by steaming for two hours at 100° in an ordinary steamer, being placed in small glass vessels with well-fitting ground-glass stoppers.

The membranes are calibrated according to the average pore diameter calculated [by a method which is fully described] from the rate of flow of water and a determination of the water content of each grade of membrane.

A difficulty in the application of this technique lies in the nature of the plant extract in which the virus must be filtered. For purifying the plant-virus suspension MacClement's adaptation of Warburg's and Christian's method of purifying a water-soluble ferment was used [ibid., xiii, p. 760], the final result being a colourless, slightly opalescent fluid with a very low protein content. This filtered rapidly through even the more impermeable membranes with very little clogging.

Weak suspensions of virus give a different filtration end-point from strong suspensions and it is therefore necessary to obtain some idea of the titre before filtration. In comparative filtration tests with suspensions of the potato virus X in sand-and-pulp filtrates and suspensions purified by the CO₂ method, the virus in the former passed the membrane, whereas that in the purified suspension was left behind on the membrane, possibly owing to aggregation of the virus particles.

The rate of filtration of virus sap from tobacco plants differed markedly according to the P_H value of the sap. Virus suspensions at P_H 8.4 filtered at less than half the pressure and in a fraction of the time necessary for the same suspension at P_H 5.8 to 6.2. No evidence was obtained that changing the P_H value of a virus suspension enables the virus particles to pass a membrane of smaller average pore diameter.

FREISLEBEN (R.). *Weitere Untersuchungen über die Mykotrophie der Ericaceen*. [Further investigations on mycotrophy in the Ericaceae.]—*Jb. wiss. Bot.*, lxxxii, 3, pp. 413–459, 7 figs., 1935.

A comprehensive, tabulated account is given of the writer's further

studies at the Halle Agricultural and Plant Breeding Institute on mycotrophy in the Ericaceae [*R.A.M.*, xiii, p. 255]. As with the species of *Vaccinium* previously used, a retardation of growth was observed in 21 species belonging to 13 genera in pure cultures on a peat-sand mixture compared with similar material inoculated with *M[ycelium] r[adiciis] myrtilli* α . Among the plants thus affected were *Ledum palustre*, *Rhododendron* spp., *Kalmia latifolia*, *Vaccinium* spp., *Calluna vulgaris*, and *Erica* spp., whereas *Arbutus unedo* and *Arctostaphylos uva-ursi* grew equally well with or without mycorrhiza. The adverse effects of cultivation without an endophyte could in all cases be counteracted by the inoculation of the substratum with mycorrhiza or soil fungi (e.g., *Penicillium glaucum*). Mycorrhizal formation was further experimentally induced in most of the Ericaceae by inoculation with *M. r. myrtilli* α , but here again the two Arbutaceae failed to respond, possibly because their natural symbionts are distinct from those of the other genera in the family.

In further experiments on other media, good growth was attained only by plants in the presence of symbiotic fungi, especially on peat. Less thrifty development occurred in infected cultures on sand (the reason for this being unknown), on peat inoculated with killed mycelium of *M. r. myrtilli* β , *M. r. uliginosi*, and *P. glaucum* [*ibid.*, xiv, p. 247; xv, p. 243], in asymbiotic cultures on a mineral nutrient agar with or without sugar, and on agar or sand with a mineral nutrient solution supplemented by the ether-insoluble fraction of *Boletus edulis* or by the aqueous solution of an alcoholic extract of *M. r. uliginosi*, *P. glaucum*, and *B. edulis*. It appears probable that the organic compounds in peat and its extracts, peptone, malt extract, potato agar, and fungal extracts exert an adverse influence on the growth of the plants, and that the stimulatory action of the mycorrhizal fungi is due rather to their capacity for inactivation, destruction, or absorption of the retarding principle than to any direct assistance in the development of the host. It is concluded that in natural soils a similar significance for the Ericaceae attaches to the endophytes and soil fungi representing the components of peritrophic mycorrhiza [*ibid.*, xiv, p. 247].

RAYNER (M. C[HEVELEY]). **Mycorrhizal associations in Scots Pine.**—*Forestry*, ix, 2, pp. 154–155, 1935.

A pseudomycorrhiza figured in an earlier paper by the author [*R.A.M.*, xiv, p. 410] was attributed to Hymenomycete mycorrhiza with a secondary association of a dark brown mycelium which was thought to be *Mycelium radiciis atrovirens* [*ibid.*, xii, p. 386], but is now referred to *M. r. nigrostrigosum* [*ibid.*, xiv, p. 187]. In the Dorset area from which the material was collected hyphae of both fungi are common as secondary growths on the mantles of mycorrhiza of Scots pine [*Pinus sylvestris*], and those now believed to show secondary infection by *M. r. nigrostrigosum* were collected from trees showing growth degeneration. The last-named fungus also forms mycorrhiza on Scots pine on moorlands in the north of England, where material was also collected from a degenerating plantation.

BROWN (A. M.). **A study of coalescing haploid pustules in *Puccinia helianthi*.**—*Phytopathology*, xxv, 12, pp. 1085–1090, 2 figs., 1935.

Details are given of an experiment conducted at Winnipeg, Canada, to determine the possibility of initiating the process of diploidization in *Puccinia helianthi* by hyphal fusions between two haploid mycelia of opposite sex [*R.A.M.*, xii, p. 318].

A total of 288 pairs of pustules was used, obtained by sowing sporidia from germinating teleutospores on sunflower seedlings [*ibid.*, xv, p. 202] and selecting pairs of monosporidial pustules separated from each other by a distance of from 2 to 4 mm., a barrier of Eastman's Opaque No. 1 preparation being placed between the two pustules of each pair to prevent the spontaneous intermixture of the nectar. Of this number, 110 produced aecidia, which nearly always appeared and reached their full development in one component before starting in the other; they originated in the area nearest the line of fusion and thence spread to the remoter part of the leaf surface. It is apparent from these results that, when two heterothallic haploid pustules coalesce to form one compound, mycelial diploidization of the components can be effected without the intervention of pycnospores.

WERNER (A. R.). **The role of bios in the biology of the fungi of the genus *Fusarium*.**—*C. R. Acad. Sci. URSS*, N.S., iv, 1–2, pp. 61–64, 1935.

The studies briefly reported in this paper were carried out with *Fusarium vasinfectum* (the causal organism of wilt of various cultivated plants), *F. [bulbigenum var.] niveum* [*R.A.M.*, xv, p. 276] (isolated from wilted melon and watermelon plants), and an unidentified *Fusarium* of the *elegans* section, which causes a black rot and mummification of the fruit of certain varieties of watermelon in Russia. In soil naturally heavily contaminated with *F. [b. var.] niveum*, mycelium of the fungus was shown to be abundant on the decaying plant material but not on the mineral portion of the soil freed from vegetable matter. Spores of the organism were entirely absent from the soil, and the fact that *F. [b. var.] niveum* spores introduced into air-dry soil rapidly decreased in numbers and finally disappeared in four days from soil moistened to about 70 per cent. of its water-holding capacity but not in the soil kept in air-dry condition, leads the author to consider that they were used as food by the protozoa (amoebae) and putrefactive bacteria present in the soil, which were frequently observed in close proximity to the spores. The spores of *F. [b. var.] niveum* and of the other two species were shown to be relatively rich in bios [*ibid.*, xv, p. 170], and it is believed that their disappearance from soil is to be explained by their effect on the other organisms which are strongly activated by bios.

In pure culture the three fungi produced spores only in natural media containing bios, but not on synthetic media in the absence of it. In the author's view, the plant parasitic activity of these fungi is chiefly due to their physiological need of bios, which forces them to invade living tissues in their search for this principle; in other words, their virulence to plants is controlled by the bios content of the substratum.

PORTER (J. M.). **The effect of phosphorescent and fluorescent minerals upon the growth of fungi in cultures.**—*Proc. Ind. Acad. Sci.*, xlv (1934), pp. 76-78, 1935.

The irradiation of certain fungi by the phosphorescent light from zinc sulphide or luminous paint, either from the inside or outside of the culture dishes, generally caused a temporary inhibition of growth and increased sporulation (e.g., in *Fusarium oxysporum*, *Helminthosporium inaequale* [*Curvularia inaequalis*: *R.A.M.*, xv, p. 245] and *Sclerotinia americana* [*S. fructicola*: *ibid.*, xv, p. 161 and above, p. 304]). Luminous paint on the inside of the culture chamber lids retarded the germination of *Alternaria solani* spores to such an extent that none germinated in 24 hours and only 10 per cent. in 60. This substance, therefore, may possibly be of some use as a fungicide. No effect was exerted by certain other phosphorescent and fluorescent materials tested.

COSTANTIN (J.). **L'enroulement de la variété de Pomme de terre Belle de Juillet.** [Leaf roll in the Belle de Juillet Potato variety.]—*C. R. Acad. Sci., Paris*, cci. 23, pp. 1080-1083, 1935.

Details are given of the writer's attempts to cure leaf roll and mosaic in the Belle de Juillet (Juli) potato variety by transferring the plantings from the level or low elevations to a high altitude (1,400 m.) in the Pyrenees, the object being accomplished in two years in the case of the former and in four in that of the latter disease [cf. *R.A.M.*, xv, p. 172]. The variety in question is stated to suffer to the extent of 100 per cent. from leaf roll in low-lying situations. In this connexion attention is drawn to the remedial effect of high latitudes on potato mosaic, as shown by R. G. Newton's experiments in British Columbia [*ibid.*, ii, p. 519].

DYKSTRA (T. P.). **A top-necrosis virus found in some apparently 'healthy' Potatoes.**—*Phytopathology*, xxv, 12, pp. 1115-1116, 1935.

Grafts from Earliest of All and Bliss Triumph potatoes affected with mild, crinkle, and leaf-rolling mosaic [*R.A.M.*, xv, p. 246] to healthy Arran Victory and President resulted in many cases in the development of top necrosis on the two latter varieties. A similar effect followed the grafting of 'healthy' Burbank and Earliest of All scions on President. It was evident that these symptoms could not be attributed to the X virus [*ibid.*, xv, p. 172] (the latent mosaic of 'healthy' commercial potatoes), which produces in Arran Victory and President only a mosaic type of mottling without necrosis. In 1933 grafts supplied by R. N. Salaman from England of Up-to-Date, a symptomless carrier of virus B and usually accompanied by X, on Arran Victory and President also caused top necrosis. In order to determine whether the X virus is a necessary component of this disease, grafts of Up-to-Date were made on U.S.D.A. Seedling No. 41956, resistant to the virus in question [*ibid.*, xii, p. 388], by which procedure the streak-producing B component of Up-to-Date is retained to the exclusion of X. Grafts of the infected seedling to Arran Victory produced typical top necrosis symptoms, while in the case of tomato the B virus was transferred

without noticeable effects, its presence being demonstrated by the grafting of infected tomatoes on Arran Victory and President, which resulted in top necrosis. No symptoms developed in Burbank, White Rose, Irish Cobbler, Earliest of All, and Bliss Triumph on which Up-to-Date was grafted, indicating that these varieties probably serve as symptomless carriers of virus B. The latter is believed, however, to be absent from certain other American varieties, the grafting of which on Arran Victory or President leads only to mottling without necrosis.

KAHO (H.). **Das Verhalten der Eiweissstoffe gesunder und abbaukranker Kartoffelknollen gegen Salze.** [The reaction of the albumins of healthy and degenerate Potato tubers to salts.]—*Bull. phytopath. Exp. Sta. Univ. Tartu* 31, 22 pp., 1935.

The writer discusses and tabulates the data resulting from his experiments in Esthonia on the response of the albumins dissolved in the cell sap of healthy and 'degenerate' (leaf roll, mosaic, and crinkle) potato tubers [*R.A.M.*, xiv, p. 785] to salting out with various mineral salts, e.g., those of potassium, sodium, calcium, magnesium, strontium, barium, and the alkali earths, and to heat. Both healthy and diseased material of the Väike verev, Reichskanzler, Early Rose, and Bravo varieties was used, together with sound Majestic, Imperator, Allerfrüheste Gelbe, and Maercker tubers for comparison. There was found to be no essential difference between the albumin of healthy and degenerate potatoes in respect of its reaction to the above-mentioned elements, except that in sound tubers it shows a higher degree of ionization and is thus somewhat more resistant to dehydration than the albumin of diseased stock.

RAYNAUD (R.). **Les ennemis de la Pomme de terre.** [Enemies of the Potato.]—*Vie agric. rur.*, xxiv, 50, pp. 379-381, 1935.

Both wart disease [*Synchytrium endobioticum*] and late blight (*Phytophthora infestans*) are stated to cause very heavy losses in the Vosges Mountains (France), and in addition to notes on their symptoms and control a list is given of varieties resistant to both diseases, viz., Belle de Fontenay, Eureka Extra Early, Hollande du Gâtinais, Juli, Dargill Early (somewhat susceptible to blight), Quarantaine violette, Rosa, and Rosafolia (reaction to *P. infestans* uncertain) [cf. *R.A.M.*, xv, p. 250].

HORI (M.). **Studies on the relation of *Phytophthora infestans* (Mont.) de Bary to resistant plants.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 225-244, 1935. [Japanese, with English summary.]

Phytophthora infestans was shown by inoculation experiments to be capable of penetrating the epidermal cells of nearly all the 80 test plants, entry being particularly easy in most of the Solanaceae, including resistant potato [see preceding abstract] and tomato varieties. These were the only two hosts on which the fungus was able to attain its full development, other plants reacting merely by the formation of small, sterile spots at most. In resistant potato varieties the invaded cells are destroyed more rapidly than in susceptible sorts, with the result that the organism cannot make any further growth. Premature

disorganization of the tissues also follows mass infection of susceptible varieties by the fungus. Slight growth may be made by *P. infestans* in young leaves of certain other Solanaceae (particularly *S. nigrum*, egg-plant, and *Salpichroa rhomboidea*) and in those of *Vicia unijuga*, while in most of the non-Solanaceous hosts penetration was soon followed by disorganization of the tissues.

KUILMAN (L. W.). **Het onderzoek over de mentek-ziekte van de Rijstplant.** [The study on the 'mentek' disease of the Rice plant.] —*Landbouw*, xi, 3, pp. 77–113, 1935. [English summary.]

After summarizing the history of previous investigations during the past 70 years on the 'mentek' [root rot] disease of rice in the Dutch East Indies [*R.A.M.*, xiv, p. 743], the writer describes his studies in Java, beginning at the end of 1930, on the relation of the trouble to a series of complex soil changes known as 'reduction'.

When the Baok variety was grown in Zinzadze's solution without an additional supply of ammonium nitrate, symptoms closely resembling those of the root rot developed; 96 per cent. of the nitrogen originally present in the medium as ammonium nitrate was exhausted in six weeks. Both in the laboratory and in the field protein synthesis in the young leaves of plants deprived of nitrogen was found by extensive analyses to proceed at the expense of the protein reserves in the older foliage, which turned rusty and ultimately died. Nitrogen deficiency induced 'mentek' symptoms equally in resistant (Lati sail Assam and Brondol poetih) and susceptible (Baok and Temas) varieties, and no appreciable differences were detected between the nitrogen contents of the two groups. No evidence was forthcoming that the disease is due to a very strong reducing action of the soil or to manganese, iron, and nitrite ions liberated in such soils.

ABE (T.). **On the resistance of conidia of *Piricularia oryzae* to low temperatures.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 206–215, 1 diag., 1935. [Japanese, with English summary.]

The germinability of conidia of the rice blast fungus (*Piricularia oryzae*) [*R.A.M.*, xv, p. 225] maintained in a refrigerator under dry conditions at -4° to -6° C. gradually diminished, but 20 per cent. or more were found to survive 50 to 60 days' freezing, while 14 per cent. were still viable on the 81st day from the commencement of the test. In another trial 10 to 30 per cent. of the conidia exposed to a constant temperature of -10° survived until the 75th day. When conidia produced on artificial media were transferred to the refrigerator at -10° in a suspension, only 1 to 2 per cent. germinated after 24 to 25 days and none after 31, indicating that the resistance of these organs to low temperatures is greater under dry than under wet conditions. In a further experiment, frozen conidial suspensions after 24 hours' exposure to a temperature of -10° were kept for $1\frac{1}{2}$ hours in three incubators at 16° , 28° , and 40° . Germination was most profuse at the lowest and least abundant at the highest temperature, showing that the frozen conidia are less liable to injury by slow thawing at a relatively low temperature than by rapid thawing at higher ones.

MUNDKUR (B. B.). **Parasitism of *Sclerotium oryzae* Catt.**—*Indian J. agric. Sci.* v, 3, pp. 393–414, 1935.

An account is given of cultural and inoculation experiments which were started in Pusa following the outbreak of a serious sclerotial disease of rice in 1930–31 in the Rajasahi and Dacca division of Bengal. The sclerotial material studied included collections from several localities in India and Burma, and also a culture sent in by Park from Ceylon (a chromogenic strain of *Sclerotium oryzae*) [*Leptosphaeria salvinii*: *R.A.M.*, xv, p. 114]; one forwarded by Tullis from the United States, originated from a mono-ascosporous culture of *L. salvinii* [*ibid.*, xv, p. 47]; a non-chromogenic strain of (?) *S. oryzae* from Park in Ceylon; a culture labelled *S. sphaeroides* [*ibid.*, xiii, p. 653] from Nakata in Japan; and one labelled *S. oryzae sativae* [*ibid.*, xi, p. 801] from Hemmi in Japan; the last-named fungus did not resemble any of the Indian collections and has never as yet been recorded in India, for which reason the culture was destroyed. Apart from two other forms, the study of which is not yet completed, the cultures obtained from Indian and Burmese material were referred to *S. oryzae*, and on the media tested formed small, smooth sclerotia measuring from 156 to 600 μ in diameter (the mean diameters from 242 to 405 μ). Re-examination of Briosi's and Cavara's specimens of *S. oryzae* showed the measurements given by them of the sclerotia (160 to 180 μ) to have been inaccurate, the diameters found by Ashby and by the author ranging from 225 to 330 μ (mean 270 μ) and 208 to 339 μ (mean 262 μ), respectively. Cultures of the fungus which were sent to Tullis produced the conidial stage (*Helminthosporium sigmoideum*), and this stage was also obtained at Pusa by incubating agar from a culture in a moist chamber in diffuse light.

Two of the local isolates, the non-chromogenic strain of (?) *S. oryzae* from Ceylon, and *S. sphaeroides* from Japan proved in culture to belong to one species, differing from *S. oryzae* in its hyaline mycelium; its larger, rough sclerotia; its inability to change the colour of the substratum; and in the absence of smoky, lobed appressoria and chlamydospore-like structures. The name *S. sphaeroides* suggested by Nakata is not admissible as this binomial has already been used by Massa (1912) for another sclerotial fungus in Italy. Ashby, to whom the fungus was submitted for comparison, found that it agreed in several major respects with Matz's description of *Rhizoctonia microsclerotia* [cf. *ibid.*, xiv, p. 416], and Dr. J. Matz found that two of the cultures sent to him contained unmistakably this fungus. The Indian, Burmese, Ceylon, and Japanese cultures are therefore identified as *R. microsclerotia*, to which an isolation from rice straw in the Philippines is also referred.

Pot and field infection experiments in Pusa and observations in various parts of India from 1932 to 1934, inclusive, showed conclusively that while both *S. oryzae* and *R. microsclerotia* attack living rice plants they do not produce any significant disease symptoms under normal conditions in that country.

In an appendix to this paper, the author states that a perusal of Park's and Bertus's papers on the sclerotial diseases of rice in Ceylon showed that the culture sent to him by Park, and considered in

the body of the paper to be a non-chromogenic strain of *S. oryzae*, was really their B strain of *R. [Corticium] solani* [ibid., xv, p. 114], which these studies have obviously shown to be *R. microsclerotia*. He further states that their A strain of *S. oryzae* [referred by Tullis to *H. s. var. irregularis*: ibid., xv, p. 47] differs from all other strains of this species, inasmuch as the sclerotia are not easily separable, and have a rather rough surface and much smaller size, in which respects it tallies perfectly with a culture received by him from Nakata under the name *S. microsphaeroides* Nakata, a name which might perhaps be more appropriate.

STEVENSON (J. A.). **The South American leaf disease of Para Rubber invades Central America.**—*Plant Dis. Repr.*, xix, 20, p. 308, 1935. [Mimeographed.]

A specimen of *Hevea* rubber recently received from Costa Rica showed profuse and typical infection by both the conidial and pycnidial stages of *Dothidella ulei*, apparently not previously recorded from the country [*R.A.M.*, xi, p. 608].

SABET (Y. S.). **A preliminary study of the Egyptian soil fungi.**—*Bull. Fac. Sci. Egypt. Univ.* 5, 29 pp., 4 figs., 1935.

Samples were removed from the surface (5 cm.) layers of twelve different soils, representing both the alluvial field and sandy garden types of the Nile Delta [cf. *R.A.M.*, xv, p. 256], and plated out on agar. A table is given showing the distribution in the various samples of the 73 organisms in 35 genera encountered. The loamy soils were found to contain a richer fungus flora than the sandy ones.

Among the species of most frequent occurrence were *Rhizopus nigricans*, *R. arrhizus*, *Absidia lichtheimi*, *Mucor circinelloides* [cf. ibid., xiv, p. 655], *Aspergillus terreus*, *A. nidulans*, *A. niger*, *Penicillium expansum*, *Fusarium orthoceras* [ibid., xiii, p. 593], *Gliocladium vermoe-seni*, *Hormodendrum cladosporioides* [*Cladosporium herbarum*: ibid., xiii, p. 22], *Alternaria fasciculata* [ibid., iv, p. 61], and *A. geophila*. Other records of interest are *Cunninghamella echinulata*, *Monilia brunnea*, *Stemphylium macrosporoideum*, and three organisms determined by van Beyma (*Zbl. Bakt.*, Abt. 2, lxxxix, p. 236, 1933) as new species, viz., *Oospora egyptiaca*, *Penicillium egyptiacum*, and *Cryptomela acutispora*.

A study of the quantitative data indicates that the incidence of soil fungi in Egypt is on the whole lower than that recorded for Europe and America, due probably to the alkalinity of the Egyptian soils (lowest P_H 8.22).

KRUEGER (W. C.). **Electric uses in the greenhouse.**—*Agric. Engng. St Joseph, Mich.*, xvi, 12, pp. 475-478, 2 figs., 1935.

In connexion with a general survey of the greenhouse uses of electricity, the writer gives some further information on the installation of electric soil sterilization plants [*R.A.M.*, xv, p. 225].

Two methods of application are available. In the batch method, the soil is placed in a box, drum, or other container and heated by

means of conduction through resistance wires. In the so-called 'resistance' method the soil is heated by the passage through it of electric current. The former method involves handling the soil both before and after sterilization, thereby affording scope for reinfection, whereas the latter may be applied to the soil *in situ*, thus obviating further handling and possible contamination. Four means of applying the resistance system to soil pasteurization are in use, namely, (1) setting metal strip electrodes into the soil bed at appropriate intervals, connecting them alternately to the two poles of the electric supply, and applying the current; (2) placing the strips in a box, packing soil into it, and after treatment pushing the soil out of the bottom; (3) placing the soil on one electrode plate and pressing the other down on the soil layer; and (4) setting the requisite number of electrodes in an insulated plate unit held in a frame permitting vertical adjustment, which is then forced into the soil. This method, the only one of the four involving no handling of the electrodes themselves or the soil, is stated to have given excellent results during a year's trial at the New Jersey Agricultural Experiment Station. The estimated current requirements for $\frac{1}{2}$ to 1 yd. units are 3 to 7 kw. and 2 to 5 kw., respectively, consumption being calculated at 20 to 40 kw. hrs. per cu. yd.

BURGESS (A. H.). Deterioration of Hops during storage : observations and preliminary experiments.—*J. Inst. Brew.*, N.S., xxxii, 12, pp. 467-478, 1935.

A fully tabulated account is given of the writer's observations and experiments at the South-Eastern Agricultural College, Wye, Kent, on the deterioration of hops during storage, manifested by a reduction in the amount of α acid in the resins, usually accompanied by an increase in the β fraction. These changes have hitherto been attributed to enzymatic processes, but preliminary tests indicate that the moulds *Mucor spinescens*, *Penicillium expansum*, and *Aspergillus niger* are responsible. These organisms, isolated from deteriorating hops, were shown to be capable of effecting a rapid reduction of α acid. [This paper, read before a meeting of the Institute of Brewing Research Scheme in London on 14th October, 1935, was followed by discussion (pp. 479-481).]

DESAI (S. V.). Organisms associated with Sugarcane mosaic and their relation to the mosaic virus.—*Indian J. agric. Sci.*, v, 3, pp. 367-386, 1935.

The author states that, by using methods very similar to those described by him in a recent communication on tomato mosaic [*R.A.M.*, xiii, p. 546], he obtained in cultures of mosaic sugar-cane juice *in vitro* after numerous serial transfers the development of a pleomorphic bacterium [the morphological and biochemical characters of which are described], the non-filterable and visible (bacterial) cyclostage of which was very brief (four days out of 100 of its complete life-cycle), but with a long and stable, filterable and invisible (virus) cyclostage. In view of the repeated failure of this organism in all its cyclostages to reproduce mosaic by inoculation into healthy sugar-cane,

comparative serological tests were carried out, the results of which suggested that the mosaic virus was the stable filterable cyclostage, while the bacterial stage was antigenically different from the other cyclostages, and also from the mosaic virus. It was also shown in a series of inoculation experiments that the mosaic virus was neutralized by its own anti-serum and also by that of the filterable form. The latter serum, as well as the anti-serum of the bacterial stage and anti-mosaic virus serum, when inoculated into healthy sugar-canes, failed to confer immunity to the plants from inoculation with the mosaic virus.

DESAI (S. V.). **Stinking rot of Sugarcane.**—*Indian J. agric. Sci.*, v, 3, pp. 387–392, 1935.

An outbreak was observed in 1933 of a sudden and rapid wilt of sugar-cane of the Co. 300 and Co. 313 varieties at the Mushari Sugar-cane Research Station, associated with an actively developing light grey, wet, and very offensively smelling rot, progressing from the top downwards; most of the plants thus affected were found to be also attacked by top shoot borers [*Scirpophaga*] which, of themselves, very rarely kill the plants outright. In the early stages of the disease bacteria were detected, mostly in the intercellular spaces, in apparently healthy tissues far removed from the 'dead heart', but also intracellularly where the rot was already advanced; the vascular bundles were also invaded, but did not decay as the rest of the tissues. In the field the disease appeared to spread to adjoining stools which were quite healthy and did not show attack by the top shoot borers. Isolations from tissues below the rotted area yielded, among other micro-organisms, two types of bacteria, one of which formed white and the other bluish colonies on nutrient agar. Inoculated into sound canes through superficial wounds neither bacterium caused infection, but when introduced deeply into the tissues and under excessively moist conditions the bluish culture produced a restricted rot, but not the white. Inoculations with the bluish bacterium through the borer holes resulted in rapid infection of the tissues, while the white type remained inactive under these conditions; mixed cultures of the two types proved, however, to be much more virulent than the bluish type alone. Further experiments showed that the disintegrated tissue from rotting canes was also highly infective. In special tests the sugar-cane proved to be the only susceptible host plant, and particularly the varieties Co. 300 and 313. Prolonged cultivation on agar appeared to reduce the virulence of the organisms.

The pathogenic, bluish bacterium is a small, non-sporulating, non-capsule forming, Gram-negative, greenish-yellow fluorescent rod with one polar flagellum, and 1.2 to 2.2 by 0.6 to 1.2 μ ; it liquifies gelatine, ferments glucose, saccharose, lactose, and glycerine without formation of gas, peptonizes but does not coagulate milk, nor reduce nitrates, does not form indol, and produces pectinase. A comparison of these characters with those of *Bacterium aptatum*, *Bact. marginale*, and *Bact. xanthochlorum* [shown in a table] suggests that the organism of the stinking rot of sugar-cane belongs to the group of *Bacillus pyocyaneus*, and is named *B. pyocyaneus saccharum* [R.A.M., xv, p. 1].

DE SORNAY [P.]. **La Canne à Sucre. Plantation par boutures de têtes et dégénérescence de la variété.** [Sugar-cane. Planting with terminal slips and varietal degeneration.]—*Bull. Ass. Chim. Sucr.*, lii, 9-10, pp. 638-642, 1935. [English and German summaries.]

The writer sets forth and briefly discusses his reasons for disagreeing with Martin's opinion (expressed in the February issue of the above-mentioned periodical) that the sereh disease of sugar-cane [*R.A.M.*, xii, pp. 57, 77] is a result of reproduction by means of terminal slips instead of well-lignified cuttings from the body of the plant [see next abstract]. In Mauritius, Hawaii, Madagascar, and other sugar-producing countries, where the former method has been practised for a century or more, there has been a steady increase of yield especially with the improved agricultural technique of the last decade or two. On these and other grounds the theory that sereh disease is associated with degeneration in the sense of physiological exhaustion is unacceptable.

MARTIN (F.). **La dégénérescence de la Canne à Sucre.** [Sugar-cane degeneration.]—*Bull. Ass. Chim. Sucr.*, liii, 9-10, pp. 643-661, 1 graph, 1935. [English and German summaries.]

Replying to de Sornay's criticism of his view that the sereh disease of sugar-cane is due to reproduction by terminal slips [see preceding abstract], the writer points out, *inter alia*, that no pathogenic agent of sereh has been detected and the disease appears to be definitely non-infectious since it would otherwise have spread over the entire globe with the cuttings distributed from Java, where it has existed for over sixty years. Additional confirmation of the writer's hypothesis is considered to be afforded by the fact that the form of degeneration in question is of comparatively recent date and coincides with the growth of industrial cultivation, in furtherance of which the terminal slip method of reproduction was introduced.

NORTH (D. S.). **The gumming disease of the Sugar-Cane, its dissemination and control.**—*Agric. Rep. Colon. Sug. Refg Co.* 10 (tech.), 149 pp., 2 col. pl., 7 figs., 1935.

This is a comprehensive account of the disease caused by *Bacterium vascularum* [*Bact. vasculorum*: *R.A.M.*, x, p. 121; xv, p. 203 and next abstract] based on the author's studies of it in Australia, especially in northern New South Wales. The view is accepted that the disease originated in tropical America, was taken in cuttings to Mauritius in 1869, from that island to a number of points in New South Wales and Queensland in the middle '70's, and from Australia to Fiji. The disease is at present restricted to Australia (not recorded in Fiji since 1913), Mauritius, South America (Brazil, Colombia), and some of the West Indian islands. Severe epidemics occurred in Australia in the middle '90's, but by replacing susceptible with resistant varieties, non-ratooning of susceptible varieties, and seed piece selection the disease had disappeared from a number of areas by 1915 and was at a low ebb elsewhere. The reintroduction of susceptible varieties brought about renewed epidemics between 1919 and 1925 [*ibid.*, ii, p. 578; v, p. 386].

The yellowish leaf streaks on the expanded leaves spotted with reddish-brown dots and blotches, being usually the first symptoms to appear, are important for early diagnosis. The author's investigations, which are presented for the first time in full detail, have shown that the bacteria ooze out through wounds on the streaks of turgid diseased leaves after they are wetted by rain or dew and are carried by driving rain to wounds on the leaves of adjacent stools; the streaks appear two to four weeks later. The spines or teeth along the margins of the leaves are the main cause of the numerous minute wounds on the leaves; infection can occur only at fresh wounds, being rare at those over two days old. Puncturing and gnawing insects, of which a great number were tested, do not spread infection, but flies [*ibid.*, ix, p. 203] may be a subordinate means of spread, being important, however, as a means of occasional long-distance transmission. Gumming is primarily a highly infectious leaf-streaking disease and may remain restricted to the leaves, being shed with them as they age; as no transmission occurs in dry weather the leaves developed then are free from the secondary streaks. Under any conditions which check growth, such as waterlogged soil, dry or cold weather, the bacteria may grow down the vascular bundles in the leaf sheaths and enter the stem, causing systemic infection. The vessels which are reddened, especially in the nodes, become filled with the yellow bacterial gum or slime which oozes out from the bundles at cuts. Cavities filled with gum occur in the young joints and the leaves wilt and wither. Gummed cane juice is difficult to clarify and evaporate, causing foaming, delays crystallization, and reduces factory returns. Typical streaks on the expanded leaves can be produced easily with pure cultures of the organism. The author's 'standard' method is to make 20 to 30 fine needle-pricks, closely grouped within a circle about 2 to 3 mm. in diameter, the pricking being done through a drop of the inoculum placed on the leaf. Excepting *Saccharum spontaneum* and Kassoer, all varieties give streaks, but they may be faint and short on some commercially immune kinds such as Uba and P.O.J. 2364 and 2878. Cuttings are also readily infected at the ends, even the commercially immune sorts except *S. spontaneum* showing some gumming.

Gum sometimes does not ooze readily from the cut surfaces of infected canes; a good method to induce it is to put small cuttings of a stalk as soon as possible after it has been cut from the stool into a covered vessel to prevent evaporation and to examine after a half-hour's 'sweating'. A most searching and very reliable test for gum in canes very lightly infected is to bury fairly long cuttings in damp sand or soil for four weeks in summer or six weeks in winter until small shoots and roots have sprouted freely; after cleaning and cutting off the discoloured ends the cuttings are halved and sweated. This method can be recommended for selecting healthy setts from a lightly infected crop for planting seed-beds in isolation.

The cultural characters of the normal type of *Bact. vasculorum* present in New South Wales are described in detail and also those of some 'variants'; the index number of the normal type is 5920 31105 1202; it is not believed that definite varieties of the organism exist [*ibid.*, viii, p. 464].

A fully tabulated account is given of experiments with the hot-water treatment of cuttings. Treatment for two hours at 50° to 51° C. kills the bacteria in the sett; if the infection is very light, 1½ hours at 50° to 51° C. may be sufficient to ensure healthy shoots; treated setts rot readily, and although the buds grow they frequently become established with difficulty, but make thrifty growth as soon as they have their own roots. Malabar (Yellow Caledonia, White Tanna) is notably resistant towards the hot-water treatment.

The control of the disease has proved more difficult in New South Wales than in the tropics owing to the two-year cropping system and the great variations in rainfall from year to year; a higher level of resistance in required and indirect losses have been considerable because the available resistant varieties have been inferior croppers. Malabar has, however, been a valuable aid owing to its marked ability to survive the critical period at the end of the first year and to grow away from the disease during the second year. H.Q. 5 has also been freely used for the same reason. Of recent years successful efforts have been made in both New South Wales and Queensland to raise new superior resistant seedlings with the aid of 'resistant trial plots' [ibid., xi, p. 541 and next abstract] employing an inoculated tolerant carrier such as Innes 131 (M. 131) in a fringe row and standard varieties of known resistance as controls. Newly raised seedlings as original seedling stools are now planted out direct into these trials with one inoculated fringe stool alongside each seedling; this test permits the rapid elimination of the more susceptible seedlings and the selection of those highly resistant; the moderately or doubtfully resistant are planted again in a confirmatory trial plot which may be of sufficient size to allow at the same time for selection for general cropping value. The canes in these plots are grown to maturity at about 14 months, no advantage accruing from continuing them longer.

The reaction of 3,297 new seedlings had been determined by 1934 in gum resistance trial plots and the group parentage results are fully tabulated. An outstanding feature is the high resistance transmitted by the Kassoer derivatives to 94 per cent. of their offspring, P.O.J. 2878 being definitely superior as a parent to P.O.J. 2364. The *S. robustum* parentage has not proved superior to that of the 'noble' canes (*S. officinarum*). The author believes that with the aid of the newer superior resistant varieties now available the disease will become extinct in Australia within a few years. The report concludes with a list of 82 references to the literature of the disease.

BELL (A. F.). **Report of the Division of Entomology and Pathology.—**
Thirty-fifth Rep. Bur. Sug. Exp. Stas Qd, pp. 39–48, 1935.

This report for 1934–5 [cf. *R.A.M.*, xiv, p. 332] contains *inter alia* the following items of phytopathological interest. An insect-proof quarantine glass-house is now being used in Queensland for the reception of sugar-cane varieties from overseas. The danger attaching to the possible introduction of more virulent strains of diseases than the local ones is pointed out; some of the strains of mosaic present in the United States, for instance, differ from the Australian strain, and may include

strains capable of attacking local varieties at present considered as highly resistant.

It is believed that the small outbreak of leaf scald [*Bacterium albilineans*: loc. cit.] that occurred in the Bundaberg district has been stamped out, and in north Queensland, the position in the worst area, El Arish, has greatly improved. During the very hot, dry spell preceding the rains in 1935, a fair amount of scald was present in many fields of S.J. 4, but most of the diseased stools died out.

Gumming disease [*Bacterium vasculorum*: loc. cit. and preceding abstract] will apparently soon cease to be of importance in southern Queensland. The outbreak on S.J. 4 in the Mulgrave area was further investigated; the disease was found on 8 out of the 35 farms in the quarantine area and on one new one just outside it, and in all cases the diseased varieties were S.J. 4 or Clark's Seedling. A resistance trial was carried out, but owing to the dry summer the amount of spread was smaller than was desirable for the purpose of the experiment. Most of the canes appeared to be highly resistant.

Red stripe [*Bact. rubrilineans*: *ibid.*, xiv, p. 793] was somewhat in evidence in scattered fields in southern Queensland, following late summer rains: when the disease appeared on new varieties some anxiety was felt, but the symptoms soon passed away without causing any damage.

Much attention was paid to the Fiji disease situation [*ibid.*, xv, p. 53]; in the Maryborough district 33 out of 55 farms visited were found to be affected, in District No. 5 only 3 out of 92 farms, and in the Nambour-Maroochy district, 11 out of 88 farms. A varietal resistance trial confirmed the highly susceptible nature of the P.O.J. canes 2940, 2727, 2878, 2875, 2725, 2364, 2747, 2714, and the Uba derivatives. The resistance of P.O.J. 213 and 234 was confirmed, and Co. 290, which is being widely planted in southern Queensland, appears to be resistant.

Downy mildew [*Sclerospora sacchari*: *ibid.*, xiv, p. 333] is mainly confined to the Lower Burdekin district where it occurs on B. 208, but it is also found scattered throughout the Mackay area. In a varietal resistance trial Badila, Korpi, and S.J. 7 showed on 30th January, 1935, no diseased stools out of 38, 25, and 32, respectively, while P.O.J. 2878 and 2722 on the same date showed 10 and 18 out of 33 and 28, respectively. Field plantings, however, indicated that S.J. 7 is susceptible. In a further resistance trial carried out in another locality the order of susceptibility was found to be much the same.

Chlorotic streak [fourth disease: *ibid.*, xiv, pp. 332, 530] was again very evident to the north of Townsville and appears to be causing very considerable losses in low-lying, wet areas. It has been observed on most varieties, including D. 1135. In a number of small test plantings infection occurred chiefly in the spring and early summer in young cane growing in small depressions in the fields. The young ratoons from two yield trials the previous year showed nearly 100 per cent. chlorotic streak in plots from healthy plants.

Inspections of farms where dwarf disease [*ibid.*, xiv, p. 333] had been reported showed that the disease was very scarce, partly because the susceptible P.O.J. 2714 has not been planted and partly because the year had been a dry one.

Among minor diseases, knife-cut [*ibid.*, viii, p. 134] was relatively

severe in the Bundaberg area, where, as high winds were experienced in July, appreciable damage was done in some crops. Stem gall [*ibid.*, xii, p. 328] and the clustered stool that is perhaps related to it were more prevalent than usual on P.O.J. canes.

NAOUMOFF (N. A.). & KIRYALOVA (Mme D. N.). О двух новых плесневых грибах: *Byssochlamys musticola* и *Spicaria taurica*. [On two new mould fungi: *Byssochlamys musticola* and *Spicaria taurica*.] — *Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) 1934, 2, pp. 361–364, 2 pl., 1 fig., 1935. [French summary.]

The authors isolated a new species of *Byssochlamys* [*R.A.M.*, xiv, p. 775] from non-acid soy-bean silage must in the Caucasus and Ukraine, which they name *B. musticola* sp. nov. The spherical asci [which are figured as arising terminally on lateral branches of mycelium] contain 5 to 8 spores, 4.3 to 5.8 (to 10) by 3.6 (up to 7.5) μ ; neither antheridia nor oogonia have been found. The conidial stage is named *Spicaria musticola* sp. nov., and is characterized by undifferentiated or sparsely branched conidiophores bearing ovoid conidia 5.8 to 6.5 by 3.6 to 4.3 μ in diameter, forming long chains. Latin diagnoses of the two species are appended. *S. taurica* from wine must is also described.

WOLLENWEBER (H. W.) & REINKING (O. A.). *Die Verbreitung der Fusarien in der Natur*. [The distribution of the *Fusaria* in nature.] — 80 pp., 41 figs., Berlin, R. Friedländer und Sohn, 1935.

This is a convenient tabular arrangement of the data recorded in the writers' earlier monographs on the genus *Fusarium* [*R.A.M.*, xiv, p. 708] under the following headings: (1) the *Fusaria* and their related perfect stages with references to the figures of these fungi in '*Fusaria autographice delineata*'; (2) the *Fusaria* classified in groups and sub-groups with their related perfect stages; (3) the occurrence of the *Fusaria* on plants (including fungi), animal entities, and raw materials and products of the vegetable and animal kingdoms, as well as in the soil, air, and water, with a list of the hosts affected arranged under the fungus names; (4) a host index of the *Fusaria*, and (5) observations on genera of fungi other than *Fusarium* represented by species liable to confusion with the latter.

GADD (C. H.). *Diseases of the Tea bush. I. Diseases in general and fungi in particular*. — *Tea Quart.*, viii, 3, pp. 132–139, 1935.

In this introductory paper the author gives a general account in popular terms of plant diseases and fungi, reference being made to symbiosis, host resistance and susceptibility, and the effect of environmental factors upon parasitism.

McKINNEY (H. H.). *Evidence of virus mutation in the common mosaic of Tobacco*. — *J. agric. Res.*, li, 11, pp. 951–981, 3 figs., 1 diag., 1935.

Following brief references to his previous communications on the yellow mosaic viruses which he found to be associated with common green mosaic of tobacco [*R.A.M.*, xv, p. 261], the author gives a comprehensive account of his studies of three, among others, of such viruses which he isolated from 23 collections of the common green mosaic from different parts of the world. All these collections produced

a few bright yellow or yellowish-green spots on every one of the tobacco plants (Havana No. 38 strain of Wisconsin-Havana Seed obtained from successive cuttings from a single plant), while three other viruses which induced a green mosaic distinctly different from the common type, did not develop the yellow mosaic spots. The three yellow mosaic viruses which were investigated are described in some detail under the designations of types A, B, and C, corresponding to types 2, 3, and 1, respectively, briefly described in a previous paper [ibid., x, p. 410]; after isolation and purification they were shown to be constantly associated with the same symptoms, and thus represent permanent departures from the established type, this being the essential criterion for mutation. Furthermore, the common green mosaic virus appears to have an inhibitive effect on the yellow viruses, since when yellow mosaic tobacco plants are inoculated with common green mosaic the symptoms of the latter alone increasingly develop on the newly formed leaves, while inoculation of common green mosaic plants with one of the yellow viruses causes no change in the symptoms of the hosts.

These results are considered to indicate that, in view of the mutable nature of certain plant viruses, it is possible that viruses may be eventually isolated which will have both a prophylactic and curative effect and yet will not survive indefinitely in an active form in the plant.

HIRAYAMA (S.) & YUASA (A.). **Cytological study of Tobacco mosaic, I.**—*Ann. phytopath. Soc. Japan*, v, 3, pp. 197–205, 21 figs., 1935. [Japanese, with English summary.]

All the tissues of mosaic Hatano tobacco examined by the writers were found to contain X bodies and other cell inclusions [*R.A.M.*, xiv, pp. 51, 799], which were specially prominent in all the leaf tissues, stems (with hairs), roots (excluding hairs, caps, and calyptrogens), and flowers (hairs, calyces, corollas, and anthers). These bodies were accompanied by striate material, raphides, crystalline plates, and amorphous structures, while the anther tissues further contained an abundance of calcium oxalate crystals, and those of the roots bipyramidal, rhombohedral, or hexahedral crystals.

Inoculations were made by rubbing the leaf surface with a cloth soaked in the expressed juice of diseased foliage. The X bodies and other cell inclusions developed in the leaf tissues in about a week, rather more rapidly in the roots. The formation of the X bodies was observed to be preceded by a thickening of the cytoplasm, chiefly near the nucleus, followed by the delimitation of the body, the granular substance of which contains vacuoles. The striate material, raphides, crystalline plates, and amorphous bodies are regarded as products of the cytoplasm.

SPENCER (E. L.). **Studies on frencing of Tobacco.**—*Phytopathology*, xxv, 12, pp. 1067–1084, 3 figs., 1935.

In pot experiments on a heavy, neutral or slightly alkaline field soil of high water-holding capacity, severe frencing [*R.A.M.*, xiii, p. 732] developed in *Nicotiana glauca*, *N. langsdorffii*, *N. longiflora*, *N. rustica*, *N. sanderae*, *N. sylvestris*, and 16 varieties of *N. tabacum*, including Burley, Connecticut Seed Leaf, Little Orinoco, Maryland, and Turkish,

while twelve other species, among which were *N. acuminata*, *N. glauca*, *N. glutinosa*, *N. paniculata*, and *N. suaveolens* remained immune. The only other plants contracting the disease out of a further 26 tested were three Solanaceae, viz., Giant Empress petunia, *Datura stramonium*, and Bonny Best tomato.

In greenhouse experiments the disturbance was controlled by soil composting, the addition of peat, repeated applications of a nitrogenous fertilizer, and several treatments with either copper sulphate (1 per cent.), or aluminium sulphate (at the rate of 1 gm. per 4 in. pot). No pathogenic organism was found to be connected with the trouble, which could not be induced, moreover, by the withdrawal of the various elements regarded as essential to plant growth, none of the symptoms of nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur deficiencies resembling those characteristic of frenching. The addition of iron, boron, and manganese to the soil failed to prevent the development of frenching or to bring about recovery of diseased plants. The condition developed, however, in plants grown in sand by the daily addition of an aqueous extract of field soil or by that of one part of field soil to 2,000 parts of sand. It also appeared in seedlings in sand to which tap water from a deep well was added, over a period of some months.

Inasmuch as frenching was controlled without the addition of both copper and aluminium, it does not appear to be due to a deficiency of either of these two elements. From the data here presented frenching would seem to originate, not in mineral deficiency, but in response to the influence of some toxic principle present only in certain soils and operative solely under definite environmental conditions.

BANU (C.). & CONSTANTINESCU (C.). **Paraziții criptogamici în răsad-nitele cu Tutun ale Institutului, în primăvară anului 1935.** [Cryptogamic parasites in Tobacco seed-beds at the Institute in the spring of the year 1935.]—*Bul. Cultiv. Ferment. Tutun.*, xxiv, 2, pp. 171–189, 4 figs., 1935. [French summary.]

Tobacco seedlings in manured beds at the Băneasa (Bucarest) Experimental Institute for Tobacco Cultivation and Fermentation were rapidly destroyed in the spring of 1935 by the joint attacks of *Pythium de Baryanum*, *Fusarium* sp., and *Olpidium nicotianae*, the first-named originating in the seed before germination and the others appearing at a later stage. In beds on straw *Rhizoctonia* caused a certain amount of damage but was of no great practical importance. Control measures should include seed [see next abstract] and soil disinfection, sparing irrigation, and wide spacing; the soil should be treated with formalin (1 in 100).

CONSTANTINESCU (C.). **Desinfectarea semăntelor de Tutun contra cryptogamelor și menținerea facultății germinative în legătura cu tratamentul aplicat.** [The disinfection of Tobacco seed against cryptogams and the retention of germinative capacity in relation to the treatment applied.]—*Bul. Cultiv. Ferment. Tutun.*, xxiv, 3, pp. 314–320, 1935. [French summary.]

The best results in the writer's experiments on the control of fungal

seedling infection in three Rumanian tobacco varieties [see preceding abstract] were given by seed treatment with ceresan and cusisa dusts [*R.A.M.*, xiv, p. 659; xv, p. 1] at the rates of 10 and 15 gm. per kg., respectively, the former being somewhat superior both as a disinfectant and in the absence of any deleterious effects on germination.

CHAMBERLAIN (E. E.) & TAYLOR (G. G.). **The occurrence of spotted-wilt on Tomatoes in New Zealand.**—*N.Z. J. Agric.*, lii, 1, pp. 9–17, 7 figs., 1936.

A serious tomato disease, known locally as 'stripe' or 'brown top' but considered to be identical with spotted wilt [*R.A.M.*, xv, p. 65] has been present for some years in the Hutt Valley, New Zealand, and in 1934–5 appeared also in the Manawatu district. The condition, which may cause total loss, has in the last two seasons affected every plant in some late-season crops in the Hutt Valley.

Leaf-rub inoculations of healthy tomato and tobacco plants with juice expressed from diseased plants gave positive results (51 out of 75, and 12 of 32 plants, respectively); where the disease was transmitted to tobacco the secondary symptoms were in all cases preceded by local lesions apparently identical with those of spotted wilt on tobacco. Evidence was also obtained that the virus lives only for a short time when removed from the living tissues.

ADAM (D. B.). **Leaf mould : a disease of glasshouse-grown Tomatoes.**—*J. Agric. S. Australia*, xxxix, pp. 600–604, 2 figs., 1935.

The author records the occurrence of tomato leaf mould (*Cladosporium fulvum*) [*R.A.M.*, xiv, pp. 610, 684] in South Australia and gives a popular account of the disease and its control.

BOYD (O. C.). **Overwintering of *Phytophthora infestans* in Tomato fields.**—*Plant Dis. Reptr.*, xix, 20, pp. 310–311, 1935. [Mimeographed.]

Belief that the agent of late blight (*Phytophthora infestans*) in tomatoes overwinters in the field in Massachusetts has hitherto been based on purely circumstantial evidence [*R.A.M.*, xiv, p. 405]. In the early summer of 1935, 70 plants of local origin were set out at the experimental farm in the site occupied in the previous year by a row of infected plants (which were ploughed under), while another 70 were planted some 40 yards away. Exceptionally dry weather prevailed from mid-July to 1st September. Late blight was first observed on 23rd September in both the check (one infection focus) and inoculated rows (21 centres). A volunteer plant that had escaped from cultivation remained free from the disease, as also did the tomatoes in neighbouring home gardens and in an extensive variety planting within 200 yards of the test. It is concluded that *P. infestans* overwintered in the 1934 crop refuse and thence initiated primary infection in the 1935 planting on the same site.

FAJARDO (T. G.) & MENDOZA (J. M.). **Studies on the *Sclerotium rolfsii* Sacc. attacking Tomato, Peanuts, and other plants in the Philippines.**—*Philipp. J. Agric.*, vi, 4, pp. 387–424, 12 pl., 2 figs., 1935.

Eight isolations of *Sclerotium rolfsii* [*R.A.M.*, xiii, p. 99; xv, p. 194]

from various hosts in different parts of Luzon, Philippine Islands, were all found to be strongly pathogenic to most of the locally grown economic plants. In culture they fell into three groups, as shown by differences in growth rate, type of colony, time required for sclerotial formation, and number, size, and colour of the sclerotia. Isolations I to VI, from tomato, bean [*Phaseolus vulgaris*], groundnut, and pineapple were apparently identical and were the commonest strain found locally; they generally produced round to ovoid, light to dark brown sclerotia. Isolation VII, from groundnut, differed from Nos. I to VI in its slower growth and coarser mycelium; it produced a few large, ovoid to very irregularly shaped sclerotia at temperatures below 33° to 35° C., at which range Nos. I to VI produced sclerotia abundantly. Isolation VIII, from groundnut, produced sclerotia only exceptionally. In all three groups growth was obtained between 10° and 35°, the optimum being between 28° and 30°, the maximum slightly under 42°, and the minimum about 10°.

The sclerotia of the common strain germinated readily on the surface of moist soil. Burial 4 in. deep in moist soil or 2 in. deep in flooded soil did not materially affect their viability, but at 5 to 6 in. nearly all the sclerotia were dead after 45 to 60 days. Infection was obtained on susceptible plants when pieces of mycelium or sclerotia were placed on or 1 in. under the soil in proximity to them; infection was, however, delayed when the fungus was buried 2 in. deep, and did not occur when it was buried 3 in. deep or more. The mycelium died after 8 months' drying in the laboratory, though some of the sclerotia survived 12 months'. The mycelium was killed after three minutes' exposure to temperatures of 48° to 50°, and both the mycelium and the sclerotia succumbed to one minute's exposure at 60° to 62°. In tests of 25 tomato varieties, the Burpee, Greater Baltimore, Dwarf Stone, and Acme were the least affected.

Eleventh Annual Report of the Imperial Forestry Institute, University of Oxford, 1934-1935.—34 pp., 1935.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiv, p. 264], contains (pp. 15-16) the following items of phytopathological interest. About two hundred Japanese sweet chestnut (*Castanea crenata*) seedlings inoculated with various strains of *Phytophthora* isolated from the common sweet chestnut [*C. sativa*] and beech were markedly susceptible to all of them. An inspection of woods infected with these organisms indicated that dry weather had reduced their destructiveness. In spraying experiments against *Meria laricis* [ibid., xiii, p. 280] in 1935 sulsol [ibid., xiv, pp. 213, 560] at much weaker strengths than formerly used gave very good control. A visit to France by W. R. Day showed that the type of poplar canker found there [ibid., xiii, pp. 150, 480] is similar to that occurring in England [ibid., xiv, pp. 408, 478], and that in both countries certain kinds of poplars are particularly susceptible and others much more resistant; it is therefore apparent that the most important means of control lies in the selection of resistant species or varieties. Of the substances tested during the year against damping-off of nursery seedlings only hortosan A, a mercury compound, was of any value. Spraying

again proved successful in controlling birch leaf rust (*Melampsoridium betulinum*) [ibid., xiii, p. 334; xiv, p. 464], but the source of infection could not be traced. No great fluctuations in the incidence of elm disease [*Ceratostomella ulmi*] were observed.

WORTHLEY (L. H.). **Status of Dutch Elm disease eradication.**—*Proc. nat. [U.S.] Shade Tree Conf., 1935*, pp. 111-122, 1935.

In this review of the present situation of the Dutch elm disease (*Graphium [Ceratostomella] ulmi*) [*R.A.M.*, xv, p. 266 and next abstracts] in the United States, the author says that encouraging results have been obtained by the eradication campaign so far. With Manhattan as the centre of a circular area, in July, 1935, the number of known diseased trees per sq. mile ranged from 10 in the zone 10 to 15 miles from the centre to 0.004 in that 45 to 50 miles distant. The organization of the campaign is briefly outlined.

FILLEY (W. O.). **Dutch Elm disease situation in Connecticut, August, 1935.**—*Proc. nat. [U.S.] Shade Tree Conf., 1935*, pp. 143-145, 1935.

In Connecticut the Dutch elm disease [*Ceratostomella ulmi*: see preceding and next abstracts] situation is now distinctly more encouraging than it was at the end of 1934. A total of 113 trees have been found to be infected; and of the further 2,675 suspects rather over 50 more cases may be expected. There appears to be no evidence that any rapid spread is occurring.

RANKIN (W. H.). **Dutch Elm disease—New York State.**—*Proc. nat. [U.S.] Shade Tree Conf., 1935*, pp. 138-143, 1935.

In reviewing the results obtained in New York State since March, 1934, when a two-years' eradication campaign against Dutch elm disease [*Ceratostomella ulmi*: see preceding and next abstracts] was initiated, the author points out that the number of diseased elms found in the State will probably not reach 2,000 for the year 1935, or slightly less than the number for 1934, though without eradication measures the number might have been expected to be about 9,000. There are strong indications that the rate of spread will be still further reduced and considerable hope afforded of establishing local control.

COLLINS (C. W.). **Insect vectors of the Dutch Elm disease caused by the fungus *Ceratostomella ulmi* (Schwarz) Buisman.**—*Proc. nat. [U.S.] Shade Tree Conf., 1935*, pp. 127-132, 1935.

In the course of laboratory and field experiments with *Scolytus multistriatus* and *Hylurgopinus rufipes* [see next abstracts] to obtain data as to their relative importance as vectors of *Ceratostomella ulmi*, 63 successful transmissions of the fungus were obtained with *S. multistriatus*, of which nine were direct, the beetles emerging from a diseased tree and carrying the inoculum to a healthy one on which they fed. On 24 occasions the fungus was isolated from egg galleries made by *H. rufipes*. Out of 19 adult individuals of *S. multistriatus* collected,

seven showed the presence of the fungus, as did one out of seven of *H. rufipes*. *S. multistriatus* transmits the disease by feeding in the crotches of twigs of healthy trees after emerging from diseased ones, and by boring into the trunks or larger branches of weakened trees to make egg galleries in the inner bark and sapwood. The fungus was also cultured from *Saperda tridentata* beetles that had fed on a diseased tree, from nymphs of the buffalo tree hopper *Ceresa bubalus* that had fed in the greenhouse on a diseased tree, and from a weevil (*Magdalis* sp.) found on a diseased tree in the field.

MAY (C.). **The Dutch Elm disease from the research standpoint.**—*Proc. nat. [U.S.] Shade Tree Conf., 1935*, pp. 122-127, 1935.

In this paper the author reviews the researches on the Dutch elm disease [*Ceratostomella ulmi*: see preceding abstract] in progress in the United States. Studies carried out by Mr. Smucker to ascertain the infection courts through which the disease organism enters the tree, indicated that infection can take place only through a wound in the bark. Apparently infections are more readily effected during the active part of the growing season than in the late summer; when inoculations were made during the latter period there was some extension of the fungus into the wood, but for the most part it remained localized near the point of inoculation. Infections occurred in both old and new injuries. Very few spores sufficed to cause infection when they were brought in contact with the water-conducting vessels. In general a high percentage of the inoculated trees became infected. Inoculations of injured and uninjured leaves gave negative results, but infections were secured when spores were placed on the bases of severed petioles. Injuries through the bark were readily found on most elms in the field. *C. ulmi* was isolated by Dr. Walter in collaboration with Mr. Moses from the smaller European elm bark beetle [*Scolytus multistriatus*], the native elm bark beetle [*Hylurgopinus rufipes*], the common elm borer [*Saperda tridentata*], the buffalo tree hopper [*Ceresa bubalus*], and the red elm bark weevil [*Magdalis armicollis*].

With regard to calculations of the date of infection based on the annual ring count, the author considers that the method is not altogether reliable as the fungus may possibly move from recent to older annual rings [*R.A.M.*, xv, p. 130]. The rate of spread varies considerably in different trees; some are discoloured throughout with only one or two rings affected, others have only a few branches discoloured, but in these several annual rings may be involved.

In experiments by Dr. Verrall on the treatment of stumps to prevent sprouting and at the same time kill the fungus in the stumps and roots copper sulphate has given so far the best results.

Dr. Walter has found that some strains of *C. ulmi* vary considerably in their cultural characters, while there are also several closely related organisms that may be confused with *C. ulmi*. On one occasion a *Graphium* isolated from a diseased elm so closely resembled the Dutch elm disease organism that very careful single-spore isolations were necessary before it could be shown that the tree was not affected by this disease.

MCDANIEL (E. I.). **A new significance concerning insects attacking Elm.**—*Quart. Bull. Mich. agric. Exp. Sta.*, xvii, 2, pp. 142-144, 4 figs., 1935.

A popular note is given on the life-histories and feeding habits of the elm bark beetles, *Scolytus scolytus*, *S. multistriatus*, and *Hylurgopinus rufipes* [*R.A.M.*, xv, p. 130 and preceding abstracts] with reference to their actual or potential importance as agents in the transmission of Dutch elm disease [*Ceratostomella ulmi*] in the United States [see preceding abstracts].

BOUDRU (M.). **La maladie de l'Orme en Belgique.** [The Elm disease in Belgium.]—*Bull. Soc. for. Belg.*, xlii, 12, pp. 508-522, 1935.

Dutch elm disease (*Ceratostomella ulmi*) [see preceding abstracts] first appeared in Belgium in 1919-20, when it was recorded from the north of the country, after which it rapidly spread southwards. At present in western and central Belgium the destructive effects of the disease are very pronounced, while in the south-east the progress, though continuous, is slower.

A study of the relationship between resistance and soil types gave indefinite results and the addition of lime and nitrate of lime to experimental elms inoculated with *C. ulmi* had no effect on the progress of the disease.

Absorption by the branches of standing elms indicated that malachite green [*R.A.M.*, xv, p. 244] 1 in 10,000 was toxic to the fungus and stimulated a vigorous reaction by the tree. Sunoxol and chinisol [loc. cit.] had no injurious effect when absorbed by the roots of young elms, whereas mercuric chloride, malachite green, and ethyl mercuric chloride (mostly 1 in 10,000) caused complete desiccation of the plants. It is concluded that while injections with suitable fungicides may prove satisfactory as a curative measure, the best means of prevention lies in the development of resistant varieties [*ibid.*, xv, p. 125].

SERVAZZI (G.). **Contributi alla patologia dei Pioppi. III. La 'defogliazione primaverile' dei Pioppi.** [Contributions to the pathology of Poplars. III. 'Spring defoliation' of Poplars.]—*Difesa Piante*, xii, 5, pp. 162-173, 3 figs., 1935.

By far the most important disease of Canadian poplars (*Populus canadensis*) in Italy, and one which has become progressively worse during the last ten years, is the leaf fall caused by *usicladium radiorum* [*Venturia tremulae*: *R.A.M.*, xi, p. 136; xiii, p. 605]. The disease usually appears early in spring, the leaves and sometimes whole shoots turning progressively black from the tip, after which the former become wrinkled, shrivel up, and drop; under favourable weather conditions infection may result in complete defoliation, which progresses from the top of the tree downwards. In late-season attacks the blackening is confined to portions of the leaf blades.

Infection generally reaches its maximum intensity towards the middle of spring; it slows down as the weather becomes warmer and is arrested in summer but is resumed with the return of cool weather. Field observations indicate that the fungus requires for its develop-

ment temperatures between 10° and 25° C., and when optimum temperature conditions for the fungus coincide with the initial phase of leaf development total defoliation may rapidly set in. Atmospheric humidity also favours infection, which is most prevalent and severe in localities where humidity remains high for long periods.

Trees which have been affected for several years show a smaller girth than others and a comparison of fully grown leaves from diseased and healthy trees showed a reduction of assimilating surface of 62.4 per cent. due to the disease.

In Piedmont *P. nigra*, *P. tremula*, *P. nigra* var. *italica* Dur., and *P. alba* are seldom attacked, and then only very slightly. The forms of *P. canadensis*, *P. monilifera*, *P. carolinensis*, and *P. duhamelii* are virtually immune. English and Danish poplar varieties are resistant, while hybrids of *P. canadensis* × *P. carolinensis* and of *P. canadensis* × *P. nigra* stella are, apparently, completely immune.

VAN HOOK (J. M.) & BUSTEED (R. C.). **Anthraxnose of *Betula nigra*.**—*Proc. Ind. Acad. Sci.*, xlv (1934), p. 81, 1 fig., 1935.

Birch (*Betula nigra*) trees were severely defoliated in 1932 and 1934 by *Gloeosporium betularum*, which produces a few evenly distributed subcircular spots, 2 to 3 mm. in diameter, brown with a paler centre and surrounded by a yellow zone on the upper leaf surface, lighter-coloured on the lower. The amphigenous, brown acervuli measure 200 to 650 μ and leave a cup-shaped scar on falling out. The obovate, rarely ovate, granular, irregularly guttulate spores measure 8 to 15 by 6 to 8 μ and in most cases taper to a point at the lower end.

JACKSON (L. W. R.). **A new disease of the Oriental Plane-tree (*Platanus orientalis* L.) prevalent in the Philadelphia area.**—*Proc. nat. [U.S.] Shade Tree Conf.*, 1935, pp. 77–79, 1935.

This description of the fatal wilt disease associated with a *Ceratomyces* closely resembling *C. fimbriata* that attacks *Platanus orientalis* in Pennsylvania is an expanded version of a paper already noticed from another source [*R.A.M.*, xiv, p. 408].

LOHWAG (H.). **Über eine Ahornkrankheit.** [On a Maple disease.]—*Zbl. ges. Forstw.*, lxi, 12, pp. 306–315, 5 figs., 1935.

In May, 1935, the author observed a maple tree in the Vienna Botanical Garden showing almost complete defoliation and with the cortex peeling off, exposing the fungus *Poria obliqua* (to which von Höhnel attributed a similar disease: *Oesterr. bot. Z.*, 1907, No. 5, 5 pp.) growing on the xylem. The affected area was of a dingy brown colour, except towards the upper part, where white thickened portions of the subiculum (hyphal bundles) arise at the periphery of the fruit body and appear in dried specimens as an erect, membranaceous edge (Fries's 'ambitus erectus cristatus': *Hymen. europ.*, p. 570); they act as a lever and forcibly detach the cortex in irregular segments. The brownish-yellow, septate hyphae, 6 to 9 μ in diameter, were readily discernible in the medullary rays and vessels. The wood was affected by a white rot.

PRUTENSKY (D. I.). Грибные заболевания Грецкого Ореха. [Fungal diseases of the Walnut.]—*Советские Сибиропоники* [Sovetsk. Subtrop.], 1935, 5, p. 112, 1935.

The author states that in the subtropical belt extending from the Volga (Kirghiz Republic) to Russian Central Asia (Tadjikistan) the walnut [*Juglans regia*] is severely attacked by various surface and heart rots, the most prevalent of which is caused by *Polyporus hispidus* [R.A.M., xi, p. 475], while that caused by *Fomes fomentarius* [ibid., xiv, p. 62] is somewhat less frequent. This state of things is considered to be largely due to the local methods of harvesting the nuts, which result in heavy wounding of the trunk and limbs of the trees. In Tadjikistan the leaves of the walnuts also suffer severely from attacks by *Marssonina* [*Marssonina*] *juglandis* [*Gnomonia leptostyla*: ibid., xiv, p. 203] and a species of *Cylindrium*.

FINLAYSON (E. H.). Report of the Director of Forestry, 1934-5 (fiscal year ended March 31, 1935.)—Issued by Dep. of the Interior, Canada, 45 pp., 1935.

In further experimental operations against white pine blister rust [*Cronartium ribicola*: R.A.M., xiv, p. 540 and next abstract] in the Petawawa Forest Experimental Area, Canada, in 1934, the cost of primary eradication of currants and gooseberries amounted to about 15 cents per acre. In five years' time re-eradication will probably be required, at a cost not exceeding 7.5 cents per acre. Initial protection for the white pine (*Pinus strobus*) in eastern Canada is estimated at \$600,000 with a further \$120,000 for preliminary survey work, training of workers, &c. This total expenditure would extend over eight years and would probably amount to about 20 cents per 1,000 ft. of timber cut.

Very promising results as regards cracking were given at the Forest Products Laboratory, Ottawa, by the creosote treatment of yellow birch (*Betula lutea*) railway sleepers in the green condition. Analysis of the heartwood of untreated railway sleepers made of jack pine [*Pinus banksiana*] and affected with red stain showed that *Trametes pini* and the unidentified fungus referred to as 'No. 2' [ibid., xiv, p. 484] were still alive but not extensively present [after the sleepers had been five years on the track].

Stored unbarked pulpwood showed 0.23, 49.72, and 44.34 per cent. of wood volume affected by staining [ibid., xiv, p. 729], incipient rot, and advanced rot, respectively. These figures indicate that great losses due to decay may occur in pulpwood during prolonged storage, especially in unbarked logs.

MIELKE (J. L.). Dates of production of the different spore stages of *Cronartium ribicola* in the Pacific Northwest.—*Phytopathology*, xxv, 12, pp. 1104-1108, 1 map, 1936.

Tables are presented showing the dates of aecidial and pycnidial development of *Cronartium ribicola* [R.A.M., xiv, p. 727 and preceding abstract] on *Pinus monticola* (and in one or two instances on *P. albicaulis*) and of uredo and teleutospore formation on *Ribes* in British Columbia, Washington, and Oregon from 1922 to 1934, inclusive [ibid., xiii, p. 605]. One of the earliest times of aecidial inception was in the

spring of 1934, when these organs were observed in mid-March in British Columbia and in late February in the two above-mentioned States (and Idaho). The data here assembled are stated to have been of value in the analysis of the seasonal spread of the rust in the areas under observation.

HEDGCOCK (G. G.). **Notes on the occurrence of *Tuberculina maxima* on the aecia of *Cronartium cerebrum*.**—*Phytopathology*, xxv, 12, pp. 1117–1118, 1935.

Hubert has recently listed *Cronartium cerebrum* as a host of *Tuberculina maxima* [*R.A.M.*, xiv, p. 482], but only 7 out of 225 typical specimens of the rust in the collections of the Division of Forest Pathology, Bureau of Plant Industry, Washington, D.C., were found to be infected by this parasite (all on *Pinus virginiana* from Maryland, Virginia, and Pennsylvania). Evidently, therefore, the parasitization of *C. cerebrum* by *T. maxima* is so rare as to be negligible from an economic standpoint.

HEPTING (G. H.) & DAVIDSON (R. W.). **Some leaf and twig diseases of Hemlock in North Carolina.**—*Plant. Dis. Reprtr*, xix, 20, pp. 308–309, 1935. [Mimeographed.]

Hemlocks (*Tsuga canadensis* and *T. caroliniana*) in nurseries, hedges, and forests were extensively attacked in western North Carolina in 1935 by *Melampsora farlowii*, causing a die-back of the new shoots, which curled over spirally or in the shape of a shepherd's crook; death occasionally ensued when the shoots were girdled at their junction with the stem. *Keithia tsugae*, not hitherto reported so far south, was detected on some dead leaves scattered among the healthy foliage of twig-blighted trees.

A fungus apparently identical with the *Rosellinia* described by A. H. Graves from the Southern Appalachians (*Phytopathology*, iv, p. 63, 1914) was found in profusion near Pisgah Forest causing severe defoliation of hemlocks in moist, shady positions. It is characterized by black, spherical to dome-shaped perithecia and powdery masses of conidia.

WILSON (M.). **Some observations on the decay of timber.**—*Trans. bot. Soc. Edinb.*, xxxi, 4, pp. 473–480, 1935.

In discussing the fungi associated with dry rot of timber the author states that *Merulius sylvester* [*R.A.M.*, x, p. 70; xiv, p. 68] was recently found, apparently for the first time in Great Britain, growing on a fallen branch of *Pinus laricio* in East Lothian. *Coniophora cerebella* [*C. puteana*: *ibid.*, xiv, pp. 267, 268, 541; xv, p. 186] was detected on very damp flooring of a house in Edinburgh five months after construction had been completed. The boards showed the longitudinal cracking characteristic of the fungus as well as the superficial white mycelium and the thin brown strands. *C. puteana* was isolated from the affected wood. The hypothesis that basidiospores of *M. domesticus* [*ibid.*, xiii, p. 341] cannot attack timber when it is perfectly sound, but may do so when it is infected with *C. puteana*, was not sustained in a case of dry rot in Edinburgh affecting the top story of an old house into which no new wood had been brought for several years and where no evidence of the presence of *C. puteana* was found.

preservatives, under the extremely moist conditions prevailing in the Kolle flasks, any inequalities of diffusion must be purely temporary.

Turning to the alleged difficulty of deciding, by means of the official technique, whether the fungus is developing at the expense of the wood or at that of the medium, the writers point out that, after the expiry of the period of contact between the fungus and the wood, the block is weighed and the exact amount of loss of substance thus established. Whereas in Breazzano's 'thin piece' method the consumption of wood by the organism is roughly and indirectly gauged by the relative luxuriance of hyphal growth, the official technique permits of an accurate analysis by weight of fungal activity during the experimental period.

STROHBINDER (M. F.) & DRIABINA (Mme M. M.). Опыт применения метода Конна-Холодного при микробиологическом исследовании овощей и плодов во время хранения. [An experiment on the use of the Conn-Cholodny method for the microbiological investigation of vegetables and fruit during storage.]—*Микробиол.* [*Microbiol.*], iv, 3, pp. 379–384, 2 pl., 1 diag., 1935. [English summary.]

The method originally devised by Cholodny and modified by Conn for the direct examination of soil microflora [*R.A.M.*, xv, p. 115] was successfully applied by the writers at the Engels Commercial Institute, Leningrad, to the investigation of the fungal and bacterial deterioration of stored vegetables and fruit. Among the organisms detected by this means were *Bacillus carotovorus*, and *Aspergillus glaucus* on carrots; *Monilia* [*Sclerotinia*] *fructigena* and *Phoma* on apples; and *S. fructigena* on pears.

CHU (H. T.). Notes on the penetration phenomena and haustorium formation in *Peronospora brassicae* Gäum.—*Ann. phytopath. Soc. Japan*, v, 2, pp. 150–157, 16 figs., 1935. [Japanese, with English summary.]

In inoculation experiments on eight kinds of crucifers with the conidia of *Peronospora brassicae* [*P. parasitica*: *R.A.M.*, xv, p. 188], the germ-tube was consistently observed to penetrate the epidermis through the boundary between two cells and not by way of the stomata [*ibid.*, v, p. 643]. In a moist chamber at about 15° C. conidia placed on leaves germinate in four to six hours, appressoria are formed in twelve, and infection hyphae in 18 to 24 hours. Haustoria are developed by the infection hyphae in the epidermal cells as well as in those of the inner tissues. The typical symptoms of infection by *P. parasitica* begin to appear two days after inoculation at 15°, and a day or two later the formation of conidiophores and conidia is initiated.

The haustoria in turnip and radish roots are at first spherical to piriform, becoming cylindrical or clavate, often di- or trichotomously branched, the maximum dimensions of a unbranched haustorium in this situation being 108 by 25 μ compared with only 11 by 8 μ in the leaves, where they are usually spherical and bi- to trilobate, and 57 by 14 μ in the stem of *Brassica chinensis*, where they are cylindrical or clavate and sometimes dichotomous. Some haustoria are surrounded by a sheath of variable extent from a collar round the neck to a third or half the length of the organ itself; the few full-grown haustoria found completely enveloped in vigorous roots inoculated with the fungus are probably incapable of functioning.

ARKER (H.). **Erfahrungen mit Schädlingsbekämpfungsmassnahmen im Kohlenbau.** [Experimental observations on pest control measures in Cabbage cultivation.]—*Nachr. SchädBekämpf., Leverkusen*, x, 4, pp. 162–171, 6 figs., 1935. [English summary.]

In the extensive cabbage-growing area situated on a plateau 400 m. above sea-level in the Stuttgart district of Germany, the plants are attacked in the seed-bed by *Phoma oleracea* [*P. lingam*: *R.A.M.*, xiii, p. 203] and *Peronospora parasitica* [see preceding abstract], and during the growing period by *Plasmodiophora brassicae* and *Pseudomonas campestris* [*ibid.*, xiv, p. 153]. The control of *Plasmodiophora brassicae* should be based on rational crop rotation, preferably with beets, and the sparing use of stable and liquid manure, for which lime, calcium cyanamide, basic slag, and potash should be substituted [*ibid.*, x, p. 574], while it is also to some extent amenable to soil disinfection with 0.25 per cent. uspulun (500 l. per acre) at least a fortnight before sowing, this method being primarily used, however, against *Phoma lingam*; for cold frames an application of 0.1 per cent. solution at the rate of 5 l. per sq. m. should be made before planting and one or two more after emergence. *Peronospora parasitica* chiefly attacks varieties with conical heads under glass and may usually be combated by ample ventilation and thinning out or transplanting.

Destructive Insect and Pest Acts, England. The Fruit Tree Pests (Essex) Order of 1935. Dated December 9, 1935.—4 pp., 1935.

As from 31st December, 1935, the Local Authority for the Administrative County of Essex, or the County Borough of East Ham, Southend-on-Sea, or West Ham, or the Borough of Colchester, Ilford, Leyton, or Walthamstow, as the case may be, is empowered to order the inspection and, if necessary, the treatment of gooseberry bushes against mildew (*Sphaerotheca mors-uae*), apple trees against scab (*Venturia inaequalis*) and canker (*Nectria galligena*), pear trees against scab (*V. pirina*), and fruit trees in general against brown rots (*Sclerotinia* spp.) [*R.A.M.*, xv, p. 272].

Destructive Insect and Pest Acts, England. The Importation of Plants (Amendment) Order of 1935. Dated December 10, 1935.—2 pp., 1935.

The landing in England or Wales of any living plant of sugar beet or mangold from any country other than Scotland, Northern Ireland, the Irish Free State, the Isle of Man, or the Channel Islands is prohibited as from 1st February, 1936, except in accordance with the conditions of a licence issued by the Minister of Agriculture or an authorized inspector, with a view to preventing the introduction of virus diseases. [Similar regulations dated 6th January, 1936, are issued for Scotland.]

STRONG (L. A.). Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1935.—96 pp., 1935.

The following items concerning the control of plant diseases occur in this report. From 1929 to 30th June, 1935, inclusive, 589,290 peach trees in thirteen States were found to be infected by the phony disease [*R.A.M.*, xiv, pp. 64, 374]; the 1935 inspections revealed the presence of the trouble in a total of 102,937 trees, the percentages of affected trees being 1.69 in commercial and 2.47 in home orchards.

During the fiscal year 1935 the citrus canker [*Pseudomonas citri*: *ibid.*, xv, p. 64] eradication campaign was reorganized under the joint auspices of the Bureau of Plant Industry and the State officers of Louisiana and Texas. Between the beginning of January and the close of the fiscal year on 30th June, 1935, the disease was detected on 606 trees on 31 properties in the Galveston area of Texas. From July to December, 1934, the disease was located on 14 trees in three parishes of Louisiana. No infection has been reported in Florida since 1927.

During the calendar year 1934, 200,169,933 *Ribes* bushes were destroyed over an area of 3,358,209 acres in connexion with the campaign against white pine blister rust [*Cronartium ribicola*: *ibid.*, xiv, pp. 220, 544, and above, p. 330]. That the rust is continuing to spread is shown by the constant discovery of fresh infections in unprotected areas both on pine and *Ribes*; the disease was observed on the former host during the year for the first time in Montana.

During the fiscal year 1934-5 over 570,000 barberry bushes in the north-central States were destroyed with a view to controlling the black stem rust of cereals (*Puccinia graminis*) [*ibid.*, xiv, pp. 219, 672]. The uredo stage of the rust survived the winter of 1934-5 in considerable profusion on wheat in Texas, and, owing to the large acreage of late wheat in Kansas and Nebraska, the disease was much more prevalent than usual in those States in the following spring [*ibid.*, xiv, p. 350]. Strong south winds on 23rd and 24th June carried infection into the spring wheat area, resulting in the most widespread epidemic of recent years.

Full particulars are also given of the progress to date of the Dutch elm disease (*Ceratostomella ulmi*) control work [see above, p. 326].

United States Department of Agriculture. Bureau of Entomology and Plant Quarantine. Service and regulatory announcements July-September, 1935.—pp. 53-56, 64-65, 67, 1935.

Summaries are given of the plant quarantine import restrictions in the Colony of the Bahama Islands and the Republic of Haiti.

As from 4th July, 1935, the provision in the Uruguayan Decree of 10th January, 1934, requiring the certification of seed potatoes as specially selected material officially inspected and found free from 'degenerative' diseases [*R.A.M.*, xv, p. 248] is temporarily suspended.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, ix, 12, p. 277, 1935.

COLOMBIA (REPUBLIC OF). A Decree of 6th May, 1935, provides for the supervision by a special temporary commission of the areas on the Atlantic coast and the river ports of Magdalena with a view to preventing the import and export of material infected by injurious pests and diseases. As from 1st June, 1935, all products from disease-infested zones destined for export by the Pacific and River Magdalena routes must be accompanied by certificates vouching for the fact that the goods have been disinfected. The Inspector of 'Sanidad Vegetal', in his capacity as head of the said commission, will be empowered to adopt the necessary steps for the safeguarding of the interests involved.